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MAY 13, 1983
NEW YORK
BOTANICAL GARDEN

A NEW PITCAIRNIA FROM VENEZUELA

Lyman B. Smith

United States National Museum, Washington, D. C., U.S.A.

54a. *PITCAIRNIA STEYERMARKII* L. B. Smith, sp. nov. A *P. schultzei* Harms, cui affinis, foliorum interiorum laminis sub-linearibus ad basin versus vix angustatis apice longissime filiformeque attenuatis, scapi bracteis subfoliaceis internodia super-antibus, sepalis late rotundatis apiculatisque, petalis auranti-acis.

PLANT (immature) flowering 7 dm high. LEAVES fasciculate, (hanging,) dimorphic, the outer reduced to broadly ovate dark castaneous appressed-lepidote sheaths, the inner blades sublinear, recurved-serrulate and scarcely narrowed toward base, very long filiform-caudate, over 7 dm long, 3-10 mm wide, pale-lepidote beneath. SCAPE (immature) erect, salmon red, sparsely and finely pale-lepidote; scape-bracts strict, linear-lanceolate, filiform-attenuate, exceeding the internodes. INFLORESCENCE simple, lax, 2 dm long, sparsely white-flocculose. FLORAL BRACTS suberect, like the upper scape-bracts, exceeding the flowers; pedicels to 10 mm long, salmon-vermilion like the sepals. SEPALS oblong-lanceolate, broadly rounded and apiculate, 17 mm long, 6 mm wide, lepidote on base and midrib; petals lance-elliptic, subacute, apparently naked, 18-20 mm long, orange; ovules not observed.

Pl. 1.

VENEZUELA: FALCON: Parque Nacional Morrocoy: Distrito Silva: southern shore of Golfete de Guare, southwest of Chichiriviche, west of La Cueva de Los Indios, $10^{\circ} 54'-55' N$, $68^{\circ} 17'-19' W$, 1-3 m alt., at the foot of northern calcareous cliffs, 4 September 1982, Julian A. Steyermark & Iñigo Narbaiza 126510 (US, holotype; VEN, isotype).

It is quite appropriate that this species should be named for Julian Steyermark whose observations of fresh material provided much of the data for the description. He has given special attention to bromeliads for well over forty years.

Plate 1

SCM.
1 2 3*Pitcairnia steyermarkii* L. B. Smith

THAMNOSMA PAILENSIS (RUTACEAE), NEW SPECIES

FROM THE SIERRA DE LA PAILA, COAHUILA

MEXICO

Marshall C. Johnston

Plant Resources Center

Department of Botany

The University of Texas at Austin, 78712

P. Wilson (North American Flora 25:211-212. 1911) listed only two species of Thamnosma Torr. & Frem. in North America, T. texana (Gray) Torrey from Colorado and Arizona to northern Mexico; and T. montana Torrey & Frem. from Utah, Nevada, California, Arizona New Mexico, and Baja California. The taxon proposed shortly thereafter, Rutosma purpurea Wooton & Standley, Contributions U. S. Nat. Herb. 16: 143. 1913 from southern New Mexico has proved to be a race of T. texana. I. M. Johnston added two quite distinct species, T. trifoliata I. M. Johnst., Proc. Calif. Academy Sci. IV 12:1055. 1924) from Baja California and T. stanfordii I. M. Johnst., Journal of the Arnold Arboretum 24: 235 1943 from southern Coahuila. A recent research-trip in the Sierra de la Paila of southeastern Coahuila uncovered a fifth perfectly distinct species:

THAMNOSMA PAILENSIS M. C. Johnst., sp. nov. Suffrutices scopari-formes 2-4 dm alti minute pubescentes; folia simplices 4-11 mm longa, 1-1.5 mm lata; petala 7-9 mm longa, flava; capsulae subsessiles 6 mm longae 4 mm latae.

THAMNOSMA PAILENSIS M. C. Johnst., new sp. Taprooted, broomlike, subshrubs 2-4 dm tall; stems 20-60 from root-crown, stiffly ascending with few-several strictly ascending branches, densely beset over most of the length with straight to weakly arching, spreading or usually weakly retrose translucent whitish needle-like weakly viscid (with clinging soil-particles) hairs 0.2-0.3mm long, upper stem beset with weak, blunt, gland-tipped hairs gradually replacing the needle-like hairs toward the inflorescence. Leaves linear, 4-11 mm long (progressively reduced up-stem), 1-1.5 mm wide, with pubescence like that of the stems, laterally with recurved margins, at tip blunt. Inflorescences few-flowered terminal racemes, only one flower of inflorescence coming into anthesis at a time; pedicels 1-2 mm long, not accrescent. Sepals 4, dark green, about 1.5 mm long. Petals 4, elliptic, 7-9 mm long, bright yellow or abaxially with a green-yellow tinge, more or less obtuse. Stamens 8, all more or less equilong and more or less equaling the petals, yellow. Ovary with stipe about 1 mm long. Style about 2 mm long or 6 mm long. Fruit including stipe about 6 mm long and 4 mm wide.

Only known collection: Mexico, Coahuila, Sierra de la Paila, northern slope, south-southeast of Las Coloradas, $26^{\circ}6'$ North latitude, $101^{\circ}35'$ West longitude, 1500-2000 meters, abundant subshrub in crevices between limestone ledges, 5 February 1983, M. C. Johnston 12751 (TEX, holotype; MEXU, isotype).

At this locality *T. pailensis* was associated with various monocotyledonous rosettes such as *Agave lecheguilla*, *A. stricta*, *Dasyllirion wheeleri*; cacti such as *Opuntia bradtiana*; and numerous kinds of shrubs such as *Gochnatia hypoleuca*, *Helietta parvifolia*, *Randia pringlei*, *Mortonia*, *Flourensia*, *Leucophyllum*, etc. I had seen *T. pailensis* on previous trips in this mountain-range though never in flower. On the basis of the old vegetative plants, the taxon could not be described previously, though it was suspected to represent a new species. The new material confirms the suspicions. It seems likely then that *T. pailensis* has previously escaped the notice of botanists because of its very early flowering season. With three species of *Thamnosma*, the Chihuahuan Desert Region thus can boast of more species of this genus than any other floristic region. A key to the American species of *Thamnosma* is given below.

- A. Leaflets 3 *T. trifoliata*
- AA. Leaflet 1 (leaves simple).
 - B. Ovary-stipe about as long as ovule-bearing portion. *T. montana*
 - BB. Ovary-stipe only about 1 mm long.
 - C. Petals whitish adaxially, often whitish with purplish tinge abaxially; plants usually 5-10 dm tall *T. stanfordii*
 - CC. Petals yellow; plants 1-4 dm tall.
 - D. Petals 3-5 mm long; plants usually mostly herbaceous and often in part decumbent . . . *T. texana*
 - DD. Petals 7-9 mm long; most stems woody and erect. *T. pailensis*

The data given on style-length in *T. pailensis* indicate that some styles are about 2 mm long, others 6 mm long; although unfortunately this disparity was not noticed in the field, the approximately 10 flowers available in the exsiccatum were examined and showed these two lengths with no intermediates. On the other hand, the stamens were of about the same length in all the flowers. The populations should be examined in the field to test the idea that there is a bimodal distribution of style lengths and that this has some biological significance. No insect was observed to visit the flowers in the field.

CUSCUTA POLYGONORUM ENGELM. NEW TO LOUISIANA AND
COMMENTS ABOUT ITS ANTESTAMINAL SCALES

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While the authors were making a study of the Cuscuta from Louisiana on deposit in the Northeast Louisiana University Herbarium (NLU), they identified two of the specimens as C. polygonorum Engelm. This species has not been previously reported from the state and was not included in the recent checklist of the dicotyledons of Louisiana (Thomas and Allen 1982). Correll and Johnston (1970) gave its range as being from New England and Ontario west and southwest to Nebraska, Arkansas and Texas. Both specimens were collected along river banks and were growing on Xanthium strumarium. Citations are:

EAST BATON ROUGE--Along the Mississippi River at the junction of Stadium Drive and La. 327 at Louisiana State University garbage dump, Baton Rouge, Secs. 61 and 65, T7N, R1W. R. Dale Thomas, 78758, 5 October 1981.

OUACHITA---Along eastern bank of Ouachita River between levee and water at Louisville Avenue Bridge in Monroe. R. Dale Thomas, 67265, 5 September 1979.

While examining the specimens of C. polygonorum, the authors found that the antestaminal scales were of morphological interest. Yunker, in his monograph on Cuscuta (1921), cited the morphological views of Engelmann (scales are the dilatations of the lowermost part of the filaments), Cunningham (scales are corolline in nature and are duplications of petals), Babington (scales are staminodes) and A. Braun (basically the same as that of Engelmann). Yunker agreed with the views of Engelmann. This paper provides an account of the developmental sequence of the scales. The authors also discuss other variations in the flowers of C. polygonorum.

The antestaminal scales are so small that they are very difficult to locate in the floral bud (figure 1). As the bud develops further, the scales are initiated at the bases of the filaments (figure 2, this is a 'typical' Cuscuta flower). In due course the scales are

well differentiated from the filaments. The laterals of adjacent scales may remain distinct but they often join at their extreme bases to form a ring. The scales are not uniform in size and shape; some are truncate, toothed, bifid, trifid, acute, etc. Such variations often occur within one flower. The scales never reach the anthers (figure 3).

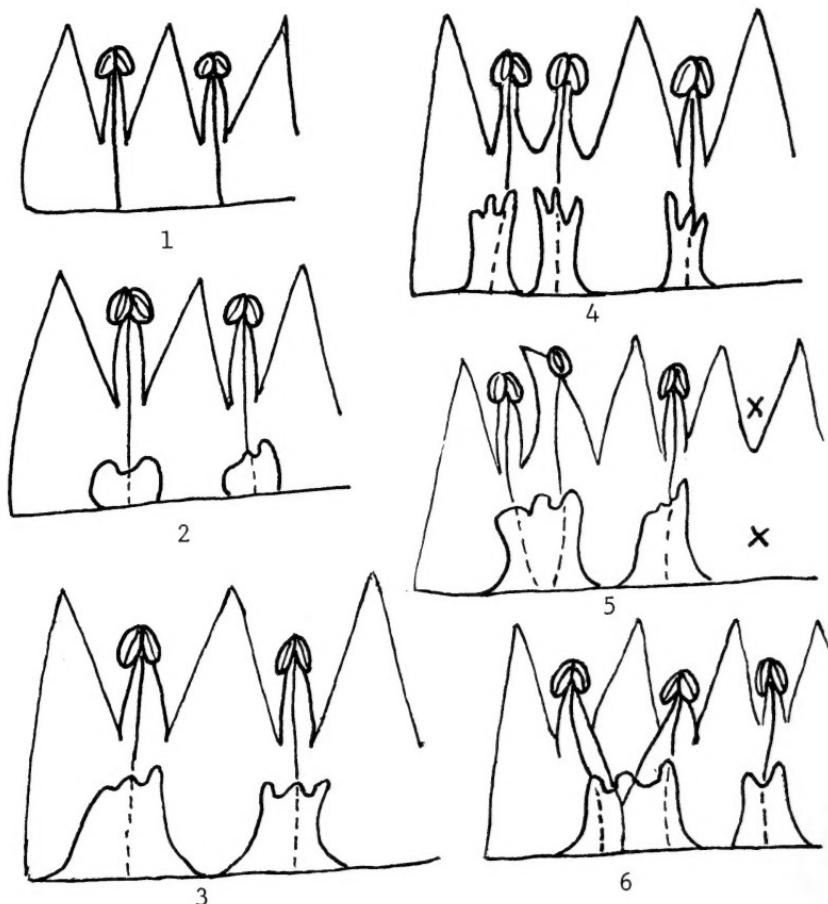
The following variations were observed in the specimens of *C. polygonorum* from East Baton Rouge Parish (Thomas 78758). Two stamens were developed between two corolla lobes and each stamen had its own trace and scale (figure 4). Between two other corolla lobes on another flower the expected stamen along with its scale and trace was absent. (The absence of the stamen and scale is denoted by the mark 'x' in figure 5). Between the two corolla lobes of another flower the stamen was not in the expected place but the anther was found attached to the lateral margin of the corolla lobe. The staminal trace was present and there was a common scale for this sessile stamen and the adjacent stamen (figure 5). In another flower the bases of two adjacent stamens were fused and there was a common scale subtending them (figure 6).

The authors feel that the above variations are morphologically significant. The absence of the scale when the stamen is absent (figure 5), the presence of two scales for two separate stamens found between two corolla lobes (figure 4), and the development of a common scale for two adjacent stamens whose bases are fused (figure 6) are all evidences supporting Engelmann's views that the scales are dilations of the lowermost part of the filaments. If the scales were to be corolline in origin or staminodal in nature, they should have developed at the base of the corolla even at the failure of the filament to develop.

Literature Cited

- Correll, D. S. and M. C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner. 1255 pp.
- Thomas, R. D. and C. M. Allen. 1982. A preliminary checklist of the dicotyledons of Louisiana. Contributions of the Herbarium of Northeast Louisiana University 3: 1-129.

Yuncker, T. G. 1921. North American and West Indian species of Cuscuta. Illinois Biological Monographs 6 (2 & 3) : 1-141. Reprinted in 1970 by Johnson Reprint Company, New York.



Figures 1-3 : Developmental sequence of antestaminal scales in C. polygonorum.

Figures 4-6 : Variations in C. polygonorum flowers.

VARIATIONS IN THE FLORAL STRUCTURE OF CUSCUTA L.

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The flowers of Cuscuta are rather simple and were it not for the antestaminal scales they would offer few taxonomic variables. However, the authors found interesting variations in Cuscuta while making a study of specimens on deposit in the Northeast Louisiana University Herbarium (NLU). An account of the observed variations in different species of Cuscuta is presented here.

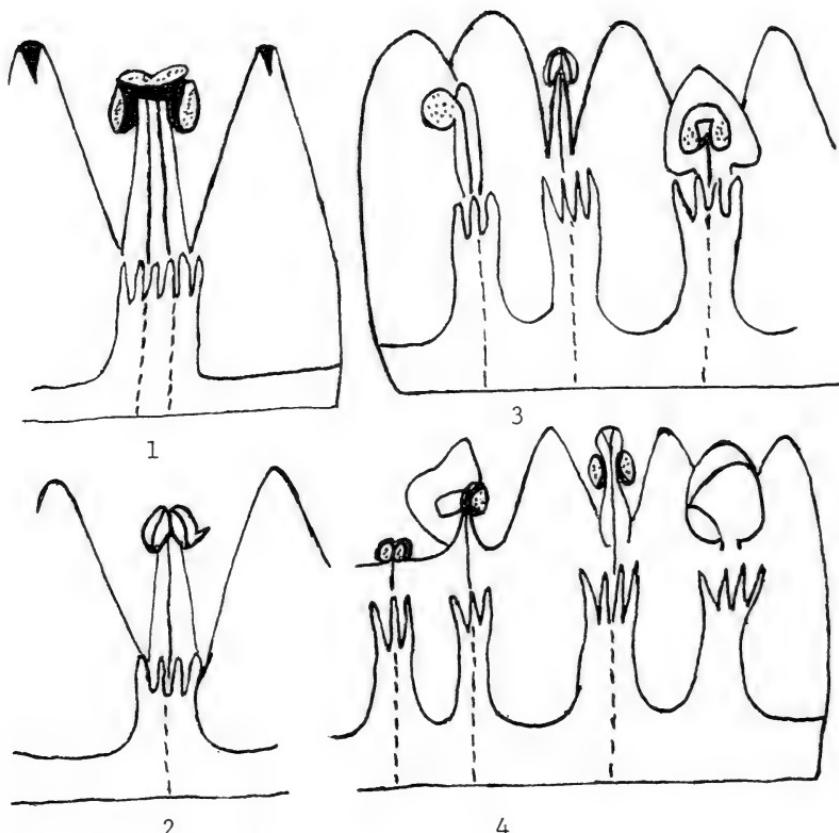
A specimen of Cuscuta campestris Yuncker from East Feliciana Parish, La. (Thomas 11546) had a filament with three fertile anther lobes (figure 1). It was parasitizing Persicaria hydropiperoides plants.

One specimen of Cuscuta gronovii Willd. ex J. A. Schultes from Franklin Parish, La. (Joye 1781) had anthers that exhibited a rudimentary lateral projection. Some anthers were reduced to various degrees and others were totally eliminated. The connective became flattened and appeared petaloid (figures 2-6). One fertile stamen developed an extended connective (figure 7). These specimens were growing on Rubus louisianus. Another collection of this species from Morehouse Parish, La. (Thomas 50299 and Pias 459) was growing on Campsis radicans, Commelina virginica, Ampelopsis arborea, and Rubus trivialis. Some of its flowers had flattened connectives with two anther cells adnate to the margins of the connective (figure 8). The stamen was reduced to a rudimentary structure (figure 9). Another specimen from Caldwell Parish, La. (Thomas 78236) growing on Campsis radicans had two adjacent corolla lobes that overlapped. The stamen with its trace and ascending scale was absent (the absence is indicated by 'x' in figure 10).

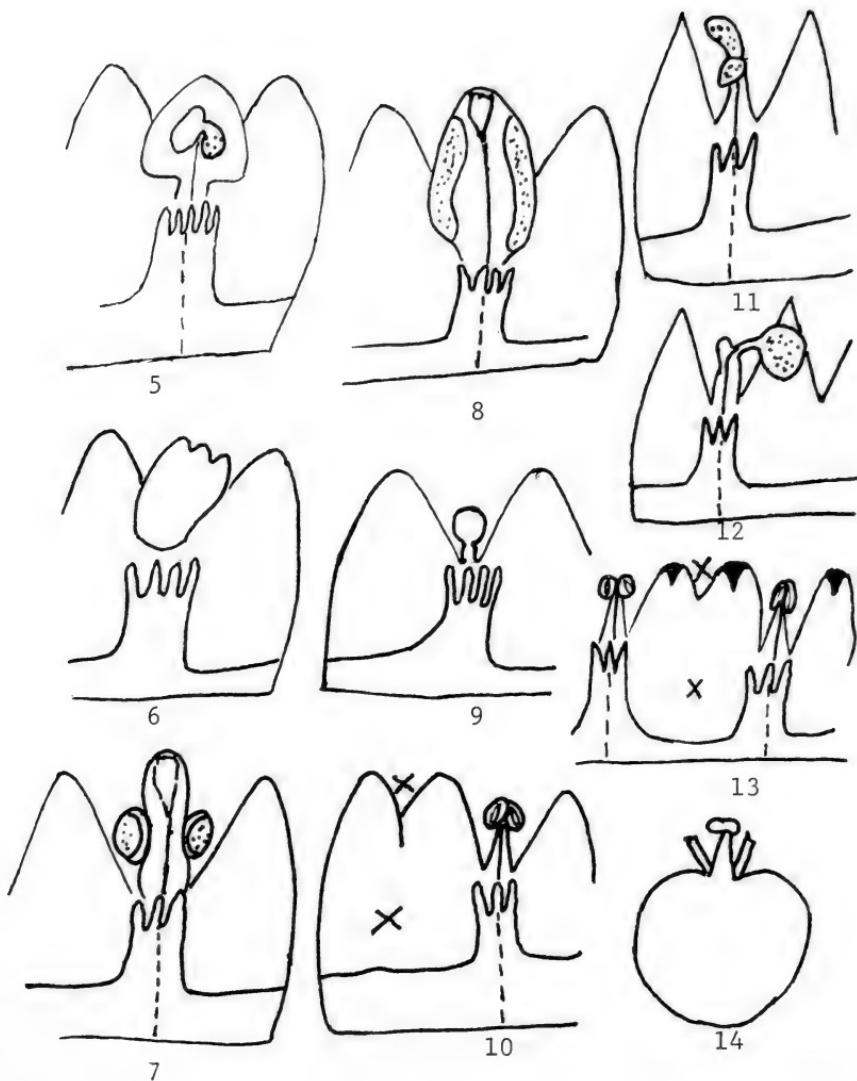
Specimens of Cuscuta pentagona Engelm. from DeSoto Parish, La. (Dixon 1385) were collected on Euphorbia corollata. These contained flowers with the two anther cells superposed and small (figure 11). Another stamen had a filament with one fertile lateral anther lobe (figure 12). One flower had a 4-lobed corolla with one lobe being large and bifurcated and in the region of the bifurcation the stamen and its basal scale were absent (marked by 'x' in figure 13).

A specimen of Cuscuta polygonorum Engelm. from Hampshire County, Mass. (Ahles 86318) had a flower with three short styles. One of the styles was fertile but the other two were without stigmas (figure 14). This collection was growing on Persicaria pensylvanica.

It is interesting to note that the above findings are mostly concerned with the absences of the stamen or with its sterility. Further, in spite of its sterility, the stamen had developed its antestaminal scale at its base.



Figures 1-4. Variations in the flowers of Cuscuta:
C. campestris (1) and C. gronovii (2-4).



Figures 5-14. Variations in the flowers of *Cuscuta*:
C. gronovii (5-10), *C. pentagona* (11-13),
and *C. polygonorum* (14).

NEW NAMES AND COMBINATIONS, PRINCIPALLY IN THE ROCKY MOUNTAIN
FLORA--III

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The second paper in this series was published in *Phytologia* 52:369-376. 1982.

AQUILEGIA MICRANTHA f. **MANCOSANA** (Eastwood) W. A. Weber,
comb. nov. A. micrantha var. mancosana Eastw., Proc. Calif. Acad.
(3) Bot. 1:77. 1897.

ASTRAGALUS KENTROPHYTA ssp. **COLORADOENSIS** (Jones) W. A. Weber,
comb. nov. A. kentrophyta var. coloradoensis Jones, Contrib.
W. Bot. 10:63. 1902.

ASTRAGALUS KENTROPHYTA ssp. **DANAUS** (Barneby) W. A. Weber,
comb. nov. A. tegetarius var. danaus Barneby, Lfl. W. Bot. 5:95.
1951.

ASTRAGALUS KENTROPHYTA ssp. **DOUGLASII** (Barneby) W. A. Weber,
comb. nov. A. kentrophyta var. douglasii Barneby, Mem. N. Y. Bot.
Gard. 13:364. 1964.

ASTRAGALUS KENTROPHYTA ssp. **ELATUS** (S. Wats.) W. A. Weber,
comb. nov. A. kentrophyta var. elatus S. Wats., Bot. King's Ex-
ped. 77. 1871.

ASTRAGALUS KENTROPHYTA ssp. **IMPLEXUS** (Canby ex Porter & Coul-
ter) W. A. Weber, **comb. nov.** A. tegetarius var. implexus Canby ex
Porter & Coulter, Syn. Fl. Colo., Add. 1874.

ASTRAGALUS KENTROPHYTA ssp. **JESSIAE** (Peck) W. A. Weber,
comb. nov. A. jessiae Peck, Lfl. W. Bot. 4:180. 1945.

ASTRAGALUS KENTROPHYTA ssp. **NEOMEXICANUS** (Barneby) W. A. Weber,
comb. nov. A. tegetarius var. neomexicanus Barneby, Lfl.
W. Bot. 6:99. 1951.

ASTRAGALUS KENTROPHYTA ssp. **UNGULATUS** (Jones) W. A. Weber,
comb. nov. A. kentrophyta var. ungulatus Jones, Proc. Calif.
Acad. Sci. II, 5: 650. 1895.

BRICKELLIA ROSMARINIFOLIA (Vent.) W. A. Weber, **comb. nov.**
Kuhnia rosmarinifolia Vent., Descr.... Cels. t. 91. 1803.

BRICKELLIA ROSMARINIFOLIA ssp. **CHLOROLEPIS** (Woot. & Standl.)
W. A. Weber, **comb. nov.** Kuhnia chlorolepis Woot. & Standl.,
Contrib. U. S. Nat. Herb. 16:177. 1913.

BRICKELLIA MICROPHYLLA ssp. **SCABRA** (A. Gray) W. A. Weber,
comb. nov. Brickellia microphylla var. scabra A. Gray, Proc.
Amer. Acad. 11:74 (1875-6).

CERASUS PUMILA (L.) Michx. ssp. **BESSEYI** (L. H. Bailey) W. A. Weber,
comb. nov. Prunus besseyi L. H. Bailey, Bull. Cornell
Univ. Exp. Sta. 70:261. t.1. 1894.

GERANIUM CAESPITOSUM ssp. **ATROPURPUREUM** (Heller) W. A. Weber,
comb. nov. Geranium atropurpureum Heller, Bull. Torr.
Bot. Club 23:1965. 1898.

HIRCULUS PLATYSEPALUS (Trautv.) W. A. Weber, comb. nov.
Saxifraga flagellaris var. platysepala Trautv., Fl. Taimyr, p. 43. 1856.

HIRCULUS PLATYSEPALUS ssp. CRANDALLII (Gand.) W. A. Weber, comb. nov. Saxifraga crandallii Gand., Bull. Soc. Bot. France 65:30. 1918.

HIRCULUS SERPYLLIFOLIUS (Pursh) W. A. Weber, comb. nov. Saxifraga serpyllifolia Pursh, Fl. Amer. Sept. 1:311. 1814.

HIRCULUS SERPYLLIFOLIUS ssp. CHRYSANTHUS (A. Gray) W. A. Weber, comb. nov. Saxifraga chrysanthia A. Gray, Proc. Amer. Acad. 12:83. 12887.

PEDICULARIS BRACTEOSA ssp. PAYSONIANA (Pennell) W. A. Weber, comb. nov. Pedicularis paysoniana Pennell, Bull. Torr. Bot. Club 6:46. 1934.

PEDIOMELUM AROMATICUM (Payson) W. A. Weber, comb. nov. Psoralea aromatica Payson, Bot. Gaz. 60:379. 1915. The genus Psoralea is typified by a South African shrub with linear, acicular leaves. Rydberg (1919), in my opinion, was quite correct in segregating out the North American taxa into a number of genera which, geographically, ecologically and morphologically stand very clearly as discrete groups.

* * *

The American species of Crepis were treated in a now classic monograph by Babcock & Stebbins (Carnegie Inst. Wash. Publ. 504. 1938. The authors seem to have been preoccupied with the species alone, and unfortunately they did not discuss the significance of their cytological findings as having a bearing on the generic level, even though Nuttall (1841) had proposed the name Psilochenia for the American species.

All of the native American species of Crepis, with the exception of two Old World species (C. elegans and C. nana), representing an ancient Tertiary extension of the genus onto western North America, have the chromosome base number $x=11$. "This is in striking contrast to the Old World species of Crepis, whose basic haploid numbers range from $x=3$ to $x=7$, 4 and 5 being much the most common" (Babcock & Stebbins, op. cit.). The authors went on to postulate that the American species may have arisen by amphidiploidy from a cross involving Crepis species with $x=4$ and $x=7$. Whether or not this can ever be substantiated, the fact remains that the American species of Crepis form an indisputably monophyletic line, spatially and genetically isolated from the Old World species.

Recently Love (1982, p. 360) transferred Crepis runcinata to Nuttall's genus Psilochenia because of this evidence, but among the rest of the species, only the type, Psilochenia occidentalis Nuttall, has a name in that genus. The following combinations are needed.

PSILOCHENIA ACUMINATA (Nutt.) W. A. Weber, comb. nov. Crepis acuminata Nutt., Trans. Am. Phil. Soc., n.s. 7:437. 1841.

PSILOCHENIA ACUMINATA ssp. **PLURIFLORA** (Babc. & Stebb.) W. A. Weber, comb. nov. Crepis acuminata ssp. pluriflora Babc. & Stebb., Carn. Inst. Wash. Publ. 504:178. 1938.

- PSILOCHENIA ATRIBARBA** (Heller) W. A. Weber, comb. nov.
Crepis atribarba Heller, Bull. Torr. Bot. Club 26:314. 1899.
- PSILOCHAENIA ATRIBARBA** ssp. **CYTOTAXONOMICORUM** (Boivin) W. A. Weber, comb. nov. Crepis atribarba var. cytotaxonomicorum Boivin, Nat. Canad. 87:31. 1960.
- PSILOCHENIA BAKERI** (Greene) W. A. Weber, comb. nov. Crepis bakeri Greene, Erythea 3:73. 1895.
- PSILOCHENIA BAKERI** ssp. **CUSICKII** (Eastw.) W. A. Weber, comb. nov. Crepis cusickii Eastw., Bull. Torr. Bot. Club 30:503. 1903.
- PSILOCHENIA BAKERI** ssp. **IDahoensis** (Babc. & Stebb.) W. A. Weber, comb. nov. Crepis bakeri ssp. idahoensis Babc. & Stebb., Carneg. Inst. Wash. Bull 504:141. 1938.
- PSILOCHENIA INTERMEDIA** (A. Gray) W. A. Weber, comb. nov. Crepis intermedia A. Gray, Syn. Fl. 1(2):432. 1884.
- PSILOCHENIA MODOCENSIS** (Greene) W. A. Weber, comb. nov. Crepis modocensis Greene, Erythea 3:48. 1895.
- PSILOCHENIA MODOCENSIS** ssp. **GLAREOSA** (Piper) W. A. Weber, comb. nov. Crepis glareosa Piper, Bull. Torr. Bot. Club 28:42. 1901.
- PSILOCHENIA MODOCENSIS** ssp. **ROSTRATA** (Coville) W. A. Weber, comb. nov. Crepis rostrata Coville, Contr. U. S. Nat. Herb. 3:564. 1896.
- PSILOCHENIA MODOCENSIS** ssp. **SUBACaulis** (Kellogg) W. A. Weber, comb. nov. Crepis occidentalis var. subacaulis Kellogg, Proc. Calif. Acad. 5:50. 1873.
- PSILOCHENIA MONTICOLA** (Coville) W. A. Weber, comb. nov. Crepis monticola Coville, Contr. U. S. Nat. Herb. 3:562. 1896.
- PSILOCHENIA OCCIDENTALIS** ssp. **CONJUNCTA** (Jeps.) W. A. Weber, comb. nov. Crepis occidentalis ssp. conuncta Jeps. ex Babc. & Stebb., Carneg. Inst. Wash. Bull. 504:134. 1938.
- PSILOCHENIA OCCIDENTALIS** ssp. **COSTATA** (A. Gray) W. A. Weber, comb. nov. Crepis occidentalis var. costata A. Gray, Bot. Calif. 1:435. 1876.
- PSILOCHENIA OCCIDENTALIS** ssp. **PUMILA** (Rydb.) W. A. Weber, comb. nov. Crepis pumila Rydb., Mem. N. Y. Bot. Gard. 1:462. 1900.
- PSILOCHENIA PLEUROCARPA** (A. Gray) W. A. Weber, comb. nov. Crepis pleurocarpa A. Gray, Proc. Amer. Acad. 17:221. 1882.
- PSILOCHENIA RUNCINATA** ssp. **ANDERSONII** (A. Gray) W. A. Weber, comb. nov. Crepis runcinata ssp. andersonii A. Gray, Proc. Am. Acad. 6:553. 1865.
- PSILOCHENIA RUNCINATA** ssp. **BARBERI** (Greenm.) W. A. Weber, comb. nov. Crepis barberi Greenm., Proc. Am. Acad. 40:52. 1904.
- PSILOCHENIA RUNCINATA** ssp. **GLAUCA** (Nutt.) W. A. Weber, comb. nov. Crepidium glaucum Nutt., Trans. Am. Phil. Soc., n.s. 7:436. 1841.
- PSILOCHENIA RUNCINATA** ssp. **HALLII** (Babc. & Stebb.) W. A. Weber, comb. nov. Crepis runcinata ssp. hallii Babc. & Stebb., Carn. Inst. Wash. Bull. 504:104. 1938.
- PSILOCHENIA RUNCINATA** ssp. **HISPIDULOSA** (Howell) W. A. Weber, comb. nov. Crepis runcinata var. hispidulosa Howell, Mem. N. Y. Bot. Gard. 1:461. 1900.

PSILOCHENIA RUNCINATA ssp. **IMBRICATA** (Babc. & Stebb.) W. A. Weber, comb. nov. *Crepis runcinata* ssp. *imbricata* Babc. & Stebb., Carn. Inst. Wash. Bull. 504:102. 1938.

SENECIO FREMONTII T. & G. ssp. **BLITOIDES** (Greene) W. A. Weber, comb. nov. *Senecio blitooides* Greene, Pittonia 4:123. 1900.

TEUCRIUM CANADENSE L. ssp. **OCCIDENTALE** (A. Gray) W. A. Weber. comb. nov. *Teucrium occidentale* A. Gray, Syn. Fl. N. Am. 2:349. 1878.

WYETHIA X MAGNA A. Nels., hybr. nov. Putative hybrid, *Wyethia amplexicaulis* (Nutt.) Nutt. X *Wyethia arizonica* A. Gray.

TYPUS: COLORADO, U.S.A. Routt Co.: Elk River, high mountain slopes, L. N. Goodding 1664 (RM 52083).

Wyethia amplexicaulis ranges widely through northwestern United States, entering Colorado as a pure population in the northwesternmost counties. *Wyethia arizonica* occupies the southwestern United States, reaching Colorado in the Four Corners area. Occupying large areas of the western Colorado plateaus is a population of plants which, because of their large stature and similar gross morphology would be called *W. amplexicaulis* except that the plants are not glabrous but are densely pubescent. Aven Nelson applied the manuscript name, *W. magna* to such plants. In the northern counties, *W. X magna* and *W. amplexicaulis* both occur with intermediates having variable pubescence. In the southwest corner of Colorado, typical *W. arizonica* occurs along with a plant somewhat larger but more glabrate, in an obvious hybrid swarm. It is noteworthy that plants leaning toward the morphology of *W. amplexicaulis* are frost hardy compared to *W. arizonica* (Weber 1952).

Over the major part of western Colorado, however, a population is widespread which seems to be a stable hybrid having the habit and detailed morphology of *W. amplexicaulis*, differing only in the copious pubescence on all parts. Since these plants continue to be the subject of inquiry by collectors, it seems appropriate to provide a name for them.

LITERATURE CITED

Babcock, E. B., & G. L. Stebbins, Jr. 1938. The American species of *Crepis*. Carnegie Inst. of Washington Publ. 504. 199 pages.

Love, Askell. 1982. IOPB chromosome number reports LXXV. Taxon 31:342-368.

Rydberg, Per Axel. 1906. Flora of Colorado. Colo. Agr. Exp. Sta. Bull. 100.

Rydberg, Per Axel. 1919. (Rosales) Fabaceae: Psoraleae, in North American Flora 24(I):1-25.

Weber, William A. 1952. The glabrate form of *Wyethia arizonica*. Lfl. W. Bot. 6:223-225.

ADDITIONS TO THE FLORA OF COLORADO--IX

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51:376-380. 1982.

NEW RECORDS FOR COLORADO
INDIGENOUS TAXA

ASTRAGALUS SESQUIFLORUS S. Wats., Proc. Amer. Acad. 10:345. 1875 (CRU). MONTROSE CO.: Hwy. 141, Dolores River 4 mi W of Urvan, T48N R17E S23, 5,500 ft. alt., on rocky slope at base of slickrock (Entrada Formation), 1 May 1982, Cudlip 45. A range extension from northeastern New Mexico and southeastern Utah. A handsome species forming prostrate mats rooting in the sandstone cracks, catching drifting sand and filling up with it to form soft hemispherical cushions. The racemes of small purple flowers hardly exceeding the cushion, and small leaves with 7-11 leaflets, not at all mucronate, are diagnostic.

CENTAURIUM EXALTATUM (Griseb.) W. F. Wight ex Piper, Contrib. U. S. Nat. Herb. 11:449. 1906. MESA CO.: grassy moist flat in and around Populus grove at mouth of Fruita Canyon, 4,700 ft. alt., Colorado National Monument, 29 Aug. 1982, Siplivinsky 5041.

CONOPHOLIS ALPINA Liebm. var. *MEXICANA* (A. Gray ex S. Wats.) Haynes, Sida 3:347. 1969 (ORO). LAS ANIMAS CO.: east edge of Barelo (Barela) Mesa, in a valley draining north into Colorado from between Barelo and Johnson Mesas; dry slope under Quercus gambelii, 18 July 1982, J. H. Robertson 16320. An extension of range northward from New Mexico.

MENTZELIA ARGILLOSA Darlington, Ann. Mo. Bot. Gard. 21:153. 1934 (LOA). GARFIELD CO.: on steep clay slopes of colluvial fans of the Roan Cliffs above Parachute Creek near Union Oil Co. headquarters, 4 miles N of Parachute (Grand Valley), 26 Aug. 1982, Weber, Harner & Clark 16359.

This species was found in the course of an ecological impact survey by Harner-White Ecological Consultants. Previously known only from a small area in Sevier County, Utah, *M. argillosa* is considered a threatened species (Welsh 1978), because "mining for gypsum and other minerals shrinks the area occupied by this distinctive plant each year." The type material does not show the rhizomes, and Darlington did not describe the habit of the plant other than to call it a perennial. Her description of the stem ("glabrous") is incorrect. It is not at all glabrous although the trichomes eventually are eroded away and the stem does become polished in the process.

Mentzelia argillosa is one of a number of unrelated species in different families that are uniquely adapted to survival in steeply sloping and constantly moving talus or scree. The plant

grows in low clumps, arising from slender, crooked white caudices that arise in groups at about six inches below ground level from a centimeter-thick horizontal rhizome that extends a meter or more in length. The caudices and rhizomes are elastic and thus are not broken as the shifting detritus of the substrate slides down-slope. Examples of this type of growth habit are found in Chenopodium alpinum, Collomia debilis and C. larsenii, Erigeron leiocephalus, Ligularia porteri, Stellaria americana and S. irrigua, and Senecio fremontii.

MUHLENBERGIA DEPAUPERATA Scribn., Bot. Gaz. 9:187.1884 (GRM). MESA CO.: Colorado National Monument, head of Devil's Kitchen Canyon, T1S R1W S31, 5,500 ft. alt., around sandstone depressions in which temporary rain-water pools form, 7 Sept. 1982, Siplivinsky 5130. The collection represents a range extension north from Arizona and New Mexico.

PANICUM HILLMANII Chase, J. Wash. Acad. Sci. 14:345. 1934. (GRM). BACA CO.: 1 mi E of Bartlett; roadside ditch and edge of field; common in the area, 13 Aug. 1982, R. L. McGregor 33619. PROWERS CO.: roadside ditch and edge of field, 4 mi N of Holly; common and with P. capillare, 12 Aug. 1982, McGregor 33556. We are grateful to Dr. McGregor for communicating these specimens.

SPOROBOLUS FLEXUOSUS (Thurb.) Rydb., Bull. Torr. Bot. Club 32:601. 1905 (GRM). MESA CO.: Colorado National Monument, T11S R101W S17, 4,800 ft. alt., at mouth of Monument Canyon, 30 Aug. 1982, Siplivinsky 5066. The collection represents a range extension north from Arizona and New Mexico.

ADVENTIVE SPECIES

ABUTILON THEOPHRASTI Medikus, Malvenfam. 28. 1787 (MLV). MESA CO.: a weed in gardens, Colorado River Valley at Grand Junction, 2 July 1981, Joan Young 51.

ERAGROSTIS POAEOIDES P. Beauv. ex R. & S., Syst. Veg. 2:574. 1817 (GRM). MESA CO.: Grand Junction, weed in gardens, 2 July 1981, Joan Young 53; Colorado National Monument, Black Ridge trail, 3 Sept. 1982, Siplivinsky 5103.

MENTHA PIPERITA L., Sp. Pl. 576. 1753 (LAB). BOULDER CO.: Left Hand Canyon at Buckingham Park; streambottom in foothill meadow, 5,800 ft. alt., 17 Aug. 1961, A. Bush 64.

POTENTILLA ARGENTEA L., Sp. Pl. p. 497. 1753 (ROS). LARIMER CO.: Skyland Ranch near Lamb Spring, N of Estes Park, 8,000 ft. alt., 21 July 1982, Ruth A. Nelson 10838.

RANGE EXTENSIONS

HEUCHERA RUBESCENS Torr. in Stansbury (SAX). Previously known in Colorado from Sleeping Ute Mountain, Montezuma Co., last collected 23 June 1927 by Cottam 2414 (BRY). MESA CO.: Uncompahgre Plateau; Unaweap Canyon at jct. Hwy. 141 and 402, T13SR15W S16, 7,040 ft. alt., crevices of Pre-Cambrian granite cliffs of near old historic quarry, 17-18 July 1982, Siplivinsky & Beck 4183.

NAMA DICHOTOMUM (Ruiz & Pavon) Choisy (HYD). MESA CO.: Colorado National Monument, head of Devil's Kitchen canyon, T1S R1W S31, 5,500 ft. alt., around sandstone depressions in which temporary rainwater pools form, 7 Sept. 1982, Siplivinsky 5122. This is the first Colorado collection from west of the Continental Divide.

PORTULACA PARVULA A. Gray (POR). MESA CO.: Colorado National Monument: head of Devil's Kitchen Canyon, T1S R1W S31, 5,500 ft. alt., open pinon-juniper woodland, 7 Sept. 1982, Siplivinsky 5127. Known previously from a single collection in southeastern Colorado, this is the first collection from the western slope.

LITERATURE CITED

- Darlington, Josephine. 1934. A monograph of the genus Mentzelia. Ann. Mo. Bot. Gard. 21:103-226.
Welsh, Stanley L. 1978. Endangered and threatened plants of Utah: a reevaluation. Great Basin Nat. 38:1-18.

CONTRIBUTION TO THE LICHEN FLORA OF BRAZIL XII.

Lichens from Sao Jeronimo, Rio Grande do Sul State.

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The present paper is based on the study of the lichens collected by the authors in the Municipality of Sao Jeronimo in a recent date. (August 1982). The collection site is located in the northern part of the Municipality nearly 12 km NW from Arroio dos Ratos City. All the lichen species here reported were collected growing on Mimosa bimucronata which constituted in the place visited a small open forest. The only disturbance that the authors could observe was that the place is pastured by cattle. All the specimens of this arborescent Mimosa were submitted to a good sunny exposition.

Despite the reduced number of species listed, the authors consider a matter of interest to publish the results obtained as a contribution to the knowledge of the lichen flora growing on indigenous trees. Moreover the Municipality of Sao Jeronimo which is placed in the western part of the Central Lowlands of Rio Grande do Sul State (Depressao Central) will be exposed to damages originated by the development of the Great Porto Alegre.

The specimens collected by the junior authors (LCB/. LPP/.) are preserved in HAS and those collected by the senior author (HO/.) are deposited in his private herbarium.

Anthracotheceum goniostomum Müll. Arg.

On bark, LPP/06, HO/8091.

Caloplaca crocea (Kremph.) Haf. & Poelt.

On trunk, not common, LCB/01, HO/8090.

Caloplaca erythrantha (Tuck.) Zahlbr.

On bark and small branches, locally common, LPP/02, HO/8095, HO/8097 pr.p.

Candelaria concolor (Dicks.) Arn.

On bark, HO/8097 pr.p.

Dimerella atrolutea (Vainio) Malme.

On bark, not common, LPP/12, HO/8094. Malme (1935) reported this species in Rio Grande do Sul State from two localities: Silveira Martins and Cruz Alta.

Dimerella pyrophthalma (Mont.) Vezda.

LPP/07.

Heterodermia diademata (Tayl.) Awasthi.

On trunk with Polypodium sp., LCB/05, HO/8122.

Heterodermia flabellata (Fée) Awasthi.

LCB/02.

Heterodermia obscurata (Nyl.) Trevis.

On trunk, LCB/03, HO/8119.

Hypotrachyna pluriformis (Nyl.) Hale.

On trunk, HO/8106, HO/8121. New to Rio Grande do Sul State.

Lecanora minarum Vainio.

On big branches, only specimen seen, HO/8096. New to Rio Grande do Sul State.

Lecidea russula Ach.

On big branches, not common, LPP/01, HO/8093.

Leptogium austroamericanum (Malme) Dodge.

On trunk, not common, HO/8104.

Parmelina consors (Nyl.) Hale.

On trunk, only specimen seen, LCB/11, HO/8116.

Parmelina pilosa (Stizb.) Hale.

On trunk, HO/8113.

Parmotrema cetratum (Ach.) Hale.

On trunk, HO/8115.

Parmotrema reticulatum (Tayl.) Choisy.

LCB/09.

Parmotrema rigidum (Lynge) Hale.

LCB/10. This species is largely distributed in America reaching the extreme southern United States (Hale 1965). In Brazil is known only from the type locality: Piratiny, Rio Grande do Sul State (Lynge 1914).

Parmotrema subsumptum (Nyl.) Hale.

On small branches, few specimens seen, HO/8103.

Parmotrema tinctorum (Nyl.) Hale.

Trunk, LCB/08, HO/8114, HO/8118.

Pertusaria depressa (Fée) Mont. & v. d. Bosch.

On bark, HO/8098.

Pertusaria pulchella Malme.

On trunk, LPP/03, HO/8092.

Phaeographina caesiopruinosa (Fée) Müll. Arg.

On trunk and branches, Tocally common, LCB/12, HO/8089.

Phlyctella brasiliensis (Nyl.) Zahlbr.

On trunk, LPP/04, HO/8099. New to Rio Grande do Sul State.

Pseudoparmelia carneopruinata (Zahlbr.) Hale.

On trunk, HO/8110.

Punctelia canaliculata (Lynge) Krog.

On branches, LCB/07, HO/8102, HO/8111, HO/8120.

Punctelia microsticta (Müll. Arg.) Krog.

LCB/06.

Punctelia subpraesignis (Nyl.) Krog.

On trunk, very scarce, LCB/04, HO/8117. Formerly known from one locality in western Rio Grande do Sul State (Osorio, Aguiar & Homrich 1981).

Ramalina celastri (Spreng) Krog & Swinsc.

On branches, not common, LPP/10, HO/8125.

Ramalina peruviana Ach.

On branches, LPP/11, H0/8107, H0/8123.

Teloschistes exilis (Michx.) Vain.

On trunk and branches, LPP/08, H0/8105, H0/8112.

Teloschistes flavicans (Sw.) Norm.

On branches, LPP/09, H0/8100.

Usnea dichroa Mot. var. spinulosa Mot.

On branches, scarce, LPP/15, H0/8108. New to Rio Grande do Sul.

Usnea poliotrix Kremph.

On branches, very scarce, LPP/14, H0/8101. According with the information at our disposal (Motyka 1936/38) this species is known in this State from two localities: Porto Alegre and Neu-Württemberg (at present Municipality of Panambis).

Usnea rubicunda Stirt.

LPP/13. New to Rio Grande do Sul State.

SUMMARY.

Thirty five lichen species growing on Mimosa bimucronata and collected in the Municipality of São Jerônimo are listed.

The following species are added to the known flora of Rio Grande do Sul State: Hypotrachyna pluriformis, Lecanora minarum, Phlyctella brasiliensis, Usnea dichroa var. spinulosa and Usnea rubicunda.

LITERATURE CITED.

HALE, M. E. Jr. 1965.

A monograph of Parmelia subgenus Amphigymnia. Contributions from the United States National Herbarium 36(5): 193-358.

LYNGE, B. 1914.

Die Flechten der ersten Regnellschen Expedition. Die Gattungen Pseudoparmelia gen. nov. und Parmelia Ach. Arkiv för Botanik 13(13): 1-172.

MALME, G. O. 1935.

Die Gyalectazeen der ersten Regnellschen Expedition. Arkiv för Botanik 26A (13): 1-10.

MOTYKA, J. 1936/38.

Lichenum generis Usnea studium monographicum. Pars Systematica. Vol. I & II. 651 pgs. Leopoli.

OSORIO, H. S., L. W. AGUIAR & M. H. HOMRICH. 1981.

Contribution to the lichen flora of Brazil VI. New or additional records from Rio Grande do Sul State.

The Bryologist 84 (1): 79-81.

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXVI

Harold N. Moldenke

CLERODENDRUM HILDEBRANDTII var. *PUBESCENS* Mold., var. nov.

Haec varietas a forma typica speciei caulis inflorescentiis-que laminisque foliorum subitus dense breviterque pubescentibus differt.

This variety differs from the typical form of the species in having the stems, branches, petioles, peduncles, pedicels, calyx, and lower leaf-surfaces densely short-pubescent.

The type of the variety is R. E. S. Tanner 1664 from black loam in grass around a grove of palms along the Serengeti river, Baragi area, Ikoma Chiefdom, Musomi District, in the Serengeti National Park, Lake Province, Tanzania, at 4500 feet altitude, collected on November 4, 1953, and deposited in the University of Michigan herbarium, Ann Arbor, Michigan. The collector describes the plant as growing in groups to 3 feet tall, the stems hollow, single, erect, the sap colorless, and the corollas white and aromatic.

VITEX CAPITATA f. *ALBIFLORA* Mold., f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species in having white corollas.

The type of the form was collected by Gerrit Davidsse and Angel C. González (no. 16002) on sand dunes with an open, widely spaced, deciduous forest, at 50 m. altitude, 13 km. north of Paseo de San Pablo, along the main road between Río Capanaparo and Río Cunavichito, Distrito Pedro Camejo, Apure, Venezuela, about $7^{\circ}07' N.$, $67^{\circ}44' W.$, on March 2, 1979, and is deposited in the herbarium of the Missouri Botanical Garden in Saint Louis. The collectors note that the plant was a tree, 10 m. tall, with white corollas.

ADDITIONAL NOTES ON THE GENUS CARYOPTERIS (VERBENACEAE). III

Harold N. Moldenke

Previous installments of notes on this genus were in *Phytologia* 52: 415--437 & 452--490 and 53: 146--164.

CARYOPTERIS Bunge

Additional & emended bibliography: Hance, Journ. Linn. Soc. Lond. Bot. 8: 144. 1885; Anon., Journ. Linn. Soc. Lond. Bot. Gen. Index 79. 1888; Mold., Suppl. List Comm. Vern. Names 4 & 15. 1940; Bean in Synges, Roy. Hort. Soc. Dict. Hort., ed. 2, 1: 405--406. 1956; Rouleau, Report. Nom. Gen. Ind. Kew. 56, 479, & 480. 1981; Mold., *Phytologia* 52: 501, 502, 504, & 507--509 (1983) and 53: 146--164. 1983.

CARYOPTERIS CHOSENENSIS Mold.

Additional & emended bibliography: Bean in Synges, Roy. Hort. Soc. Dict. Hort., ed. 2, 1: 405. 1956; Mold., *Phytologia* 53: 146. 1983.

CARYOPTERIS xCLANDONENSIS Simmonds

Additional & emended bibliography: Bean in Synges, Roy. Hort. Soc. Dict. Hort., ed. 2, 1: 405. 1956; Mold., *Phytologia* 53: 146 & 159. 1983.

CARYOPTERIS INCANA (Thunb.) Miq.

Additional & emended bibliography: Hance, Journ. Linn. Soc. Lond. Bot. 13: 116. 1873; Anon., Journ. Linn. Soc. Lond. Bot. Gen. Index 79. 1888; Bean in Synges, Roy. Hort. Soc. Dict. Hort., ed. 2, 1: 405 & 406. 1956; Mold., *Phytologia* 53: 146--155 & 159. 1983.

CARYOPTERIS MONGHOLICA Bunge

Additional & emended bibliography: Bean in Synges, Roy. Hort. Soc. Dict. Hort., ed. 2, 1: 405 & 406. 1956; Mold., *Phytologia* 53: 152 & 155--162. 1983.

CARYOPTERIS NEPETAEFOLIA (Benth.) Maxim.

Additional bibliography: Mold., *Phytol. Mem.* 2: 277, 379, & 529. 1980; Mold., *Phytologia* 52: 428, 430, 433, 435, & 454 (1983) and 53: 164. 1983.

Illustrations: Matsum., *Icon. Pl. Koisikov.* 1: pl. 50. 1912; Erdtman, *Svensk Bot. Tidskr.* 39: 282, fig. 5. 1945.

A low, perennial, pubescent, gregarious herb with a woody base or a subshrub, 6 inches to 4 feet tall, somewhat aromatic; stems mostly prostrate or decumbent, rarely erect; young branches ascending, pubescent; leaves decussate-opposite, short-petiolate; leaf-blades broadly ovate or rotund-ovate, about 1.5 cm. long and wide, marginally subincised-crenate or coarsely serrate with 3--5 large

teeth on each side, green and pubescent on both surfaces; secondaries about 5 per side; inflorescence axillary, solitary, the cymes 1-flowered; peduncles slender, about 1.3 cm. long, articulate above the middle, 2-bracteolate; bracts linear, short; calyx about 6 mm. long, larger than in other species of the genus, the rim 5-dentate to 4- or 5-lobed or 4-fid to about the middle, the tube very short, only about 4 mm. long, the lobes ovate, about 6 mm. long, apically acute, 1-veined, pubescent and glandulose on both surfaces; corolla pale-purple, about 1.5 cm. long or to almost 3 times as long as the calyx, sparsely pubescent on both surfaces, the tube about 4 mm. long, the lobes 4, marginally entire, the lower lobe the largest, obovate, apically entire or crisped; stamens 4, inserted near the corolla-throat, long-exserted; filaments basally villous, otherwise glabrous; anther thecae parallel; pistil exserted; style surpassing the stamens, glabrous; stigma-branches rather acute; ovary externally villous at the apex or densely pubescent, 4-lobed, 1-locular, with thick parietal placentae, 2-ovulate; fruiting-calyx enlarged, broadly campanulate, spreading, basally acute; capsule externally hirsute, the valves thickly coriaceous, broad, deeply navicular, apically acute, marginally incurved, the ventral areole half as long and deeply impressed, closed by a longitudinal, carinate, apically adnate, placental pseudoseptum; seed attached below the apex of the pseudoseptum, broadly obovoid, pendent.

This species is based on Fortune A.73 from China, deposited in the Bentham herbarium at Kew. Bentham's original (1848) description is: "?T[eucrion] nepetaefolium, herbaceum, humile, pubescens, foliis petiolatis ovatis orbiculatis subinciso-crenatis, pedunculis axillaribus unifloris, folio florali longioribus, calyce late campanulato herbaceo pubescente semi-5-fido. -- In China (Fortune n. A.73!). Caulis erecti, ramosi, semipedales. Folia semipollucaria, utrinque viridie, pubescentia. Pedunculi supra medium articulati, bibracteati. Calyces florentes 3 lin. longi, post anthesin aucti, basi acuti, lobis latis acutis. Corolla calyce subtriplo longior. Stamina longe exserta."

Strictly speaking, the taxon was not validly published by Bentham in the reference quoted above, under the present international code of nomenclature, since he expressed doubt as to its having been placed in the proper genus, the code requiring that a name must definitely be accepted by the author when published.

Maximowicz (1877) cites a Forbes and a Fortune collection (probably the type collection) and comments that "ob inflorescentiam axillarem fere a basi ramorum incipientem folia superantem et corollae amplee conformatiōnem certe a Taucrīi excludendum. Fructu ignoto locus in systemate dubius maneret, nisi corolla simillima esset illi Clerodendri divericati S. Z., quocum ad Caryopterides amandum videtur, nisi utrumque in dignitatem genericam erundum." Thus, it appears that Maximowicz also had some doubts about the correct generic position of this plant.

Franchet (1884) notes that "dans le C. nepetaefolia, les nucules sont seulement plus hérissées, un peu plus allongées, le

réseau des nervures est plus nettement indiqué que dans son congénère japonaise [C. chosanensis]." He cites only a collection from "sur les rochers et au bord des murs" in northern Hupeh, China. Forbes & Hemslay (1890) cite unnumbered collections of Everard and of Forbes from Chekiang.

Erdtman (1945) says that "On pollenmorphological grounds as well as on other evidence, Amethystea coerulea L.....ought to be closely related with and, consequently, placed in the same family as Caryopteris nepetaefolia and C. terniflora. Briquet refers Amethystea to Labiateae (1895) and Caryopteris to Verbenaceae (1894). Arguments will not be presented here as to which family these plants should rightly belong. It is evident, however, that an eventual transfer of Caryopteris -- including C. divaricata [=C. chosanensis] -- to Labiateae would lessen the remarkable pollenmorphological uniformity of that family. The triporate condition of the pollen grains in C. divaricata may possibly be regarded as an extreme development of the tricolporate pollen type of C. nepetaefolia just as the apparently triporate grains in Bouchea prismatica etc.....may be regarded as an extreme development of the tricolporate grains in Chescanum." He asserts that C. nepetaefolia belongs in a group with C. chosanensis, C. odorata, C. paniculata, C. siccanea, and C. terniflora (as opposed to the group comprising C. forrestii, C. glutinosa, C. incana, C. mongholica, & C. trichosphaera, which comprise the TRUE genus Caryopteris). In C. nepetaefolia the pollen grains are tricolporate, spheroidal, and with scattered spines.

P'ei (1932) cites Steward 1107 from Anhwei, Borchet s.n., Ching 1356, Steward 5237 & 5404, and Tsoong 3885 from Chekiang, and Faber 30, Keng 1504, Steward 1187 & 5237, and Sun 427 from Kiangsu. He notes that "This plant is related to Caryopteris terniflora Maxim., from which it differs by its prostrate or decumbent (?) habit, solitary flowers, which are much larger than those of C. terniflora, Maxim., and broadly ovate leaves."

Handel-Mazzetti (1934) cites Serre 517 and Smith 6435 from Shansi, China, and Smith 2270 from northern Szechuan. Maximowicz (1886) cites unnumbered collections of David, Forbes, Fortune, and Hancock from central China and Hupeh. In his 1879 work he cites an unnumbered Hancock collection from Ningpo. Moore (1878) cites an unnumbered Everard collection from Ningpo. Hemsley (1876) cites some "very fine specimens from the Ta-hoo Lake" area.

Collectors have encountered C. nepetaefolia in very moist shady places, in woods and shaded wood margins, in grasslands, and on steep grassy slopes, at 175--1200 m. altitude, in flower in April and May. In Kiangsu it was found by Keng "in open yards in back of a temple, not common", while in Chekiang, according to Ching, it is "common in very moist shaded places".

The corollas are said to have been "pale-blue" on Beach H.44, "bluish-purple" on Keng 1504, "lavender" on Stewart 1187, "purple" on Ching 1356, and "red and white" on Chow 66. Stewart reports that in Anhwei the "flowers and leaves are eaten".

Material of C. nepetaefolia has been distributed in some herbaria

as Labiateae sp. The species, indeed, bears a close similarity habitually to some species of Plectranthus in that family.

Citations: CHINA: Anhwei: Deng & Yao 79063 (N); A. N. Stewart 1107 [Herb. Univ. Nanking 523?]. (Ca--234044, W--1279722). Chekiang: Berchart s.n. (W--597653); Beach H.44 (W--2070654); Ching 1356 (Ba, Ca--255531, Ca--281706, N--photo, W--1246208, W--1246269); Tsoong 3885 (Ca--252792). Hupah: Baird s.n. [Avril 1873] (W--2497332); Chow 66 (N). Kiangsu: Faber M.30 (N, N); Keng 1504 (Ca--382755); P'si 2659 (W--1626897); A. N. Stewart 1187 [Herb. Univ. Nanking 5404] (Ca--243524). Shensi: H. Smith 6436 (S).

CARYOPTERIS ODORATA (Hamilt.) B. L. Robinson, Proc. Am. Acad. Sci. 51: 531. 1916.

Synonymy: Volkameria odorata Hamilt. ex Roxb., Hort. Beng., imp. 1, 46. 1814. Clerodendron odoratum Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 102. 1825 [not C. odoratum Vent., 1803]. Volkameria odoratissima Wall., Numer. List 87, no. 1812E, in syn. 1831. Clerodendron odoratum Hem. ex Wall., Numer. List 87, no. 1812, in syn. 1831. Clerodendrum helianthifolium Wall. ex G. Don in Loud., Hort. Brit., ed. 1, 247. 1830. Clerodendron guimasta Hamilt. ex Wall., Numer. List 87, no. 1812 in syn. 1831. Clerodendron helianthemifolium Wall. ex Steud., Nom. Bot. Phan., ed. 2, 1: 383. 1840. Clerodendron odoratum Buch. ex Voigt, Hort. Suburb. Calc. 466. 1845. Volkameria odorata Roxb. ex Voigt, Hort. Suburb. Calc. 466, in syn. 1845. Caryopteris wallichiana Schau. in A. DC., Prodr. 11: 625. 1847. Clerodendron odoratum D. Don ex Schau. in A. DC., Prodr. 11: 625, in syn. 1847. Volkameria sp. W. Griff., Itin. Notes [Posthum. Papers 2:] 128. 1848. Caryopteris wallichiana Bunge ex Busek, Gen. Spec. Syn. Candoll. 3: 86. 1858. Volkameria odorata [Buch.-Ham.] Roxb. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1219. 1895. Clerodendron odoratum (Hamilton) D. Don ex B. L. Robinson, Proc. Am. Acad. Sci. 51: 531, in syn. 1916. Caryopteris odorata B. L. Robinson apud A. W. Hill, Ind. Kew. Suppl. 6: 38. 1926. Volkameria odorata Buch.-Ham. ex Mold., Prelim. Alph. List Inv. Names 53, in syn. 1940. Clerodendron odoratum "[Hamilton] D. Don" ex Fedde & Schust., Justs Bot. Jahressber. 60 (2): 571, in syn. 1941. Caryopteris wallichianum Schau. ex MacMill., Trop. Plant. Gard., ed. 5, imp. 1, 104. 1943. Caryopteris wallichiana Grindel, Everyday Gard. India, ed. 16, 183. 1960. Caryopteris odorata "(Buch.-Ham. ex D. Don) B. L. Robinson" apud Suwal, Fl. Phulch. Godaw. 89. 1969. Caryopteris odorata (Roxb.) B. L. Robinson ex Mold., Phytologia 23: 428, in syn. 1972. Caryopteris wallichiana Schau. ex Mold., Phytologia 25: 236, in syn. 1973. Clerodendrum odoratum (Ham.) D. Don ex Jafri & Ghaffoor, Fl. W. Pakist. (mss.) Caryopteris odorata (D. Don) B. L. Robinson, in herb.

Bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; D. Don, Prodr. Fl. Nepal. 102. 1825; Sweet, Hort. Brit., ed. 1, 1: 322. 1826; Wall., Numer. List [49], no. 1812. 1829; G. Don in Loud.,

Hort. Brit., ed. 1, 247. 1830; Sweet, Hort. Brit., ed. 2, 416. 1830; Wall., Numer. List 87, no. 1812. 1831; G. Don in Loud., Hort. Brit., ed. 2, 247 (1832) and ed. 3, 247. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 550. 1839; Steud., Nom. Bot. Phan., ed. 2, 1: 383. 1840; Voigt, Hort. Suburb. Calc. 466. 1845; Schau. in A. DC., Prodr. 11: 625, 657, & 675. 1847; W. Griff., Itin. Notes [Posthum. Papers 2:] 128. 1848; Buek, Gen. Spec. Syn. Cen-doll. 3: 86, 106, & 503. 1858; Bocq. in Baill., Adansonia, ser. 1, 3 [Rec. Obs. Bot.]: 208. 1862; Bocq., Rév. Verbenac. 112. 1863; Brandis, For. Fl. NW. Cent. India 370. 1874; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 23: 389. 1877; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 9: 829. 1877; Maxim., Bull. Soc. Nat. Mosc. 54 (1): 40. 1879; Gamble, Man. Indian Timb., ed. 1, 299 & 503. 1881; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 27: 526. 1882; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 11: 256. 1882; C. B. Clarke in Hook. f., Fl. Brit. India 4: 597. 1885; Watt, Dict. Econ. Prod. India 2: 206. 1889; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 447 & 561 (1893) and imp. 1, 2: 1219. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 178. 1895; Collett, Fl. Siml., imp. 1, 381, fig. 121. 1902; Gamble, Man. Indian Timb., ed. 2, imp. 1, 544. 1902; Prain, Beng. Pl., imp. 1, 2: 836. 1903; Brandis, Indian Trees, imp. 1 & 2, 512. 1906; Duthie, Fl. Upper Gang. Plain 2: 228--229. 1911; B. L. Robinson, Proc. Am. Acad. Sci. 51: 531. 1916; Parker, For. Fl. Punjab, ed. 1, 404. 1918; Collett, Fl. Simla, imp. 2, 381, fig. 121. 1920; Gamble, Man. Indian Timb., ed. 2, imp. 2, 544. 1922; Heines, Bot. Bihar Orissa, ed. 1, 4: 223. 1922; Parker, For. Fl. Punjab, ed. 2, 404. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 38. 1926; Osmaston, For. Fl. Kumaon 413--414. 1927; Stapf, Ind. Lond. 2: 82. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, & 178--179, pl. 30. 1932; Junell, Symb. Bot. Upsal. 1 (4): 115 & 284. 1934; H. F. MacMill., Trop. Plant. Gard., ed. 4, 104. 1935; Kanjilal, Das, Kanjilal, & De, Fl. Assam 3: 494--495. 1939; Mold., Suppl. List Comm. Vern. Names 15. 1940; Biswas, Indian For. Rec., ser. 2, 3: 41. 1941; Fedde & Schust., Justs Bot. Jahrsber. 60 (2): 571. 1941; Mold., Suppl. List Inv. Names 2. 1941; Worsdell, Ind. Lond. Suppl. 1: 190. 1941; Mold., Alph. List Inv. Names 12. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 54, 56, 71, & 87. 1942; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 1, 104. 1943; Trotter, Common Commerc. Timb. India 229. 1944; Erdtman, Svensk Bot. Tidsk. 39: 283--284. 1945; Mold., Phytologia 2: 95. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 447 (1946) and imp. 2, 2: 1219. 1946; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 2, 104 (1946), ed. 5, imp. 3, 104 (1948), and ed. 5, imp. 4, 104. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 125, 131, 157, & 178. 1949; Parsa, Fl. Iran 4 (1): 535--536, fig. 252. 1949; Sastri, Wealth India 2 (R): 90. 1950; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 5, 104 (1952), ed. 5, imp. 6, 104 (1954), and ed. 5, imp. 7, 104. 1956; Parker, For. Fl. Punjab, ed. 3, 576. 1956; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR. 3: 216. 1958; Mold., Résumé 160, 168, 177, 214, 250, 264, 267, 392, & 445. 1959; Grindal, Everyday Gard.

India, ed. 16, 34 & 183. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 447 (1960) and imp. 3, 2: 1219. 1960; Nath, Bot. Surv. South. Shan States 305. 1960; Puri, Indian For. Ecol. 406. 1960; Haines, Bot. Bihar Orissa, ed. 2, 2: 738 & 758--759. 1961; Rau, Bull. Bot. Surv. India 3: 238. 1961; H. F. MacMill., Trop. Plant. Gard., ed. 5, imp. 8, 104. 1962; Nair & Rahman, Bull. Bot. Gard. Lucknow 76: 21. 1962; Maheshwari, Fl. Delhi 280. 1963; Prain, Bengal Pl., imp. 2, 2: 624. 1963; Sharma, Bull. Bot. Surv. India 6: 101. 1964; Dakshini, Journ. Indian Bot. Soc. 44: 416 & 419. 1965; Maheshwari & Singh, Dict. Econ. Pl. India 35. 1965; Nair, Asia Monog. India 1 (5): [Pollen Gr. W. Himal. Pl.] 35, pl. 12, fig. 154. 1965; G. L. Davis, Syst. Embryol. Angiosp. 271. 1966; Matthew, Bull. Bot. Surv. India 8: 164. 1966; Gupta, Season. Fls. Indian Summer Resorts Moos. 67, 81, & 241. 1967; Patzek & Rech. in Rech., Fl. Iran 43: 8. 1967; R. R. Stewart, Pakist. Journ. Forest. 17: 515. 1967; A. Löve, Taxon 17: 576. 1968; Mold., Résumé Suppl. 16: 9 & 19. 1968; Kapoor, Singh, Kapoor, & Srivastava, Lloydia 32: 303. 1969; Rau, Bull. Bot. Surv. India 10, Suppl. 2: 61. 1969; Sahni, Indian For. 95: 334 & 346. 1969; Suwal, Fl. Phulch. Godaw. 89. 1969; Farnsworth, Pharmacog. Titles 5 (11): iv & item 14140. 1970; Brandis, Indian Trees, imp. 5, 512. 1971; Farnsworth, Pharmacog. Titles 5, Cumul. Gen. Ind. 1971; Mold., Fifth Summ. 1: 267, 269, 271, 272, 287, 294, 356, 422, 423, 446, & 452 (1971) and 2: 734, 856, 971, & 972. 1971; Gamble, Man. Indian Timb., ed. 2, imp. 3, 544. 1972; Hocking, Excerpt. Bot. A. 21: 30. 1972; Mold., Biol. Abstr. 54: 6295. 1972; Rouleau, Taxon Index 1: 72. 1972; V. & H. Singh, Journ. Bomb. Nat. Hist. Soc. 69: 356. 1972; R. R. Stewart, Annot. Cat. in Nasir & Ali, Fl. West. Pakist. 605. 1972; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.39. 1973; Mold., Biol. Abstr. 56: 1243. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Mold., Phytologia 28: 443 & 448. 1974; Babu, Herb. Fl. Dehra Dun 395 & 396. 1977; Troth & Nicolson, Phytologia 35: 225 & 227. 1977; Mierow & Shrestha, Himal. Fls. 93. 1978; Mold., Phytol. Mem. 2: 255, 257--259, 277, 284, 346, 379, 386, 387, 462, & 529. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980; Bremen, Ind. Kew. Suppl. 16: 58. 1981; Pant, Uniyal, & Prasad, Journ. Bomb. Nat. Hist. Soc. 78: 51. 1981; Mold., Phytologia 52: 429, 430, 433, 466, 467, & 469. 1983.

Illustrations: Collett, Fl. Simla, imp. 1, 381, fig. 121 (1902) and imp. 2, 381, fig. 121. 1920; P'si, Mem. Sci. Soc. China 1 (3): pl. 33. 1932; Persa, Fl. Iran 4 (1): 536, fig. 252. 1949; Nair, Asia Monog. India 1 (5): [Pollen Gr. W. Himal. Pl.] pl. 12, fig. 154. 1965; Mierow & Shrestha, Himal. Fls. 93 (in color). 1978.

A small to rather large, spreading or straggling, free-flowering shrub, 1--7 m. tall, usually rather bushy, erect or suberect, Buddleia-like in general aspect, often evergreen, mostly nearly glabrous when mature, more or less canescent-pubescent when young; stems reddish; branches tetragonal, ascending, the young shoots densely grayish-pubescent or subtomentose, eventually glabrescent; nodes annulate; bark thin, gray, papery, peeling off in vertical strips; wood dark-gray, moder-

ately hard, with the scent of Prunus avium wood; leaves decussate-opposite, short-petiolate, odorous when crushed; petioles 5--14 mm. long, subglabrous; leaf-blades chartaceous, elliptic or elliptic-ovate to oblong-lanceolate or lanceolate, 3--11 cm. long, 1--4 cm. wide, apically acutely acuminate, marginally crenate-serrate or coarsely serrate, basally cuneate, subglabrous above, canescent-puberulent or pubescent and glandulose beneath; secondaries 4--6 per side; cymes axillary, short and dense, or mostly aggregated in narrow, terminal, cymose thyrsi, 5--12.5 cm. long, 2--3 cm. wide, densely incanous-pubescent throughout, glandulose; bracts linear, 2--2.5 mm. long, or minute, apically acute, pubescent; flowers with a sweet fragrance, sometimes faint; calyx campanulate, 2--4 mm. long, persistent, densely pubescent and glandulose on both surfaces, deeply 5- or 6-lobed or -fid to below the middle, the segments triangular; corolla bilabiate, only bilaterally symmetric, varying from blue, blue-violet, or bluish-purple to light-violet, light-mauve, purplish, lavender, or lilac, sometimes yellow in the throat, sometimes with some white or purplish-white on the lobes, usually externally densely pubescent and glandulose and sparsely pubescent within, the tube 5--12 mm. long, slightly longer than the calyx, basally villosulous, glandulose, the limb spreading, 1.2--2 cm. wide, 5-lobed, the 4 upper lobes oblong or narrowly obovate, subequal, 5--6 mm. long, apically rounded, marginally entire, the 5th (lower) lobe slightly larger, nearly 8 mm. long, broader, mostly darker blue and apically notched or obtuse, marginally entire; stamens 4, didynamous, slightly exserted from the corolla-tube but shorter than the pistil; filaments flexuous, basally densely villous; anthers bilocular, the thecae apically divaricate; style long-exserted; stigma bifid, the branches very short, obtuse; ovary externally pubescent and glandulose, imperfectly 4-locular; fruiting-calyx persistent, divided to the middle, the segments lanceolate, erect, to 6mm. long, each usually 3-ribbed; capsule small, nearly dry, dark-blue or bluish, globose, 3--6 mm. long and wide, externally densely pubescent, somewhat 4-lobed, ultimately separating into 4 concave valves, each winged along one margin and bearing one seed; seeds oblong, erect, exaluminous; chromosome number: $2n = 40$.

This species is native from northern Pakistan, Nepal, Bhutan, Sikkim, and northern India to Thailand and north to southern China. It is cultivated for ornament in southern Asia, Egypt, Zimbabwe, and elsewhere. The type is presumably from Bengal, collected by Roxburgh in or before 1814.

Wallich (1829, 1831) cites seven collections: one from Nepal, collected by him in 1821, one collected in Oudh in 1825 also presumably by him, one collected by Roxburgh in Kumaon, a cultivated specimen from the Botanical Garden in Calcutta, another from the Madras herbarium, one from Singapore, and one from Patna -- the last two from the Hamilton herbarium. The Madras specimen is the basis of the name, Volkameria odoratissima, and the one from Patna is the type of Clerodendron gulmasta. The Singapore collection is listed by him as Clerodendron odoratum Hamilt.

In addition to the forms and varieties described hereinafter, based on leaf-margin and corolla-color, there are cultivated in India, unnamed, a stiffly erect and a gracefully spreading variety.

The pollen morphology of the species is described by Erdtman (1945) and by Nair & Rahman (1962). Löve (1968) reports the chromosome number as $2n = 40$, based on Mehra & Gill 1022 from Kasauli in the western Himalayas of India.

The wood of C. odorata is used for making walking-sticks and canes in India. The shrub is planted as a hedge around gardens and in parks for its profuse sweet-smelling flowers and dense foliage and was so observed by my wife and myself in New Delhi. It can be propagated by cuttings, but may be severely injured or even killed by severe frosts.

Common and vernacular names recorded for this species include "chingāri", "kāruī", "malet", "mohāni", "moni", "nilo ghusure", "odoriferous clerodendrum", "shechin", and "sunflower-leaved clerodendrum".

Collectors have found this plant growing on open, south-facing slopes, along roadsides in bamboo and Trewia riverine forests, on old landslides with Alnus and Woodfordia fruticosa, on river-banks, in old fencerows, in Bombax-Ceiba-Trewia nudiflora riverine forests, and in temperate forests in general, from sea-level to 1800 m. altitude, in flower from November to July, as well as in October, and in fruit from May to July.

The corollas are described as having been "blue" on Sabherwal s.n. and Troth 684, "bluish" on Troth 716, "bluish-purple" on Gupta 29, "bluish-violet" on Schneider 431, "blue-purple" on Koelz 4125, "bluish-white" on Singh 5159, "light-violet" on Sahni 5183, "lavender" on Koelz 4399 and Rice 7-78, "purplish" on Qureshi s.n. [8.3.1967], "light-purplish" on Nicolson 2926, "purple" on Qureshi s.n. [10.3.1967], and "purple with a yellow center" on White 110, while Sastri (1950) refers to them as "lilac" in color.

Junell (1934), on the basis of Gamble 25340 in the Kew herbarium, describes the gynoecium morphology and places the species in the same group in the genus with C. chosenensis, C. nepetæ-folia, C. paniculata, C. siccaria, and C. terniflora. The pollen grains are tricolporate, prolate, and thickly beset with minute, faintly sloping, conical elements. Nair & Rahman (1962), on the basis of Natl. Bot. Gard. 9368 and "SI.2624", describe the pollen grains as subprolate, 57×45 μ (range $53-60 \times 42-49$ μ), the exine surface reticulate. Nair (1965) reports the dimensions as 42×35 μ , the exine granulose.

Troth describes the species as a "tall woody herb". Nicolson refers to it as "an occasional tall shrub" in Nepal. Voigt (1845) describes it as having "middle-sized sweet-scented flowers", the corolla "bluish", with an "indigo lip", and lists it from "Patna, Sirapur, Duda, Nepal, [and] Kamaon", flowering in January and February. Maximowicz (1877) describes it as "corolla rubra ad faucom intus villosula lobis omnibus anguste obovatis infimo me-

jore integro. Filamenta basi dense villosa flexuosa, antherae loculis divaricatis stylusque sequilongus ramis brevissimis obtusis longe exserta. Folia lanceolata acuminate a medio serrata."

Clarke (1885) gives the natural distribution of C. odorata, as known to him, as "Subtropical Himalaya, 0--4500 feet, from the Punjab to Bhotan; frequent". Prain (1903) records it from Bengal. Parker (1924) lists it from Punjab, giving its overall range as "Sub-Himalayan tract and outer Himalaya from the Indus eastward. Common. Ascends to 5,000 feet. Sometimes grown in gardens. Flowers Feb.--April." Dasmaston (1927) lists it from Kumaon, where, he avers, it occurs throughout the region between 1000 and 5000 feet altitude, being very common in dry mixed and scrub forests, as well as in blanks (openings) in sal forests. "It is as a rule leafless when flowering." There, he asserts, it flowers from February to April and is in fruit in May and June.

P'ei (1932) cites only Schneider 431 & 477 from Yünnan, China, and comments that "This species is characterized by its terminal cymose panicles, elliptic-ovate leaves, and densely pubescent, glandular ca[p]sules. Its allied [=allied] species are Caryopteris divercata Maxim. and C. siccanea Smith from which it differs by its densely pubescent inflorescence, and 6-lobed calyx."

Kanjilal and his associates (1939) record C. odorata from Assam, where, he says, it also blossoms from February to April and fruits from May to July. Sastri (1950) reports it as "a common and conspicuous lilac flowered shrub distributed in the outer Himalaya, from the Indus to Bhotan up to 7,000 ft. The wood is moderately hard and dark grey. It has the scent of cherry wood, and is used for making walking sticks." Nath (1960) gives the first record for the species from Burma. Rau (1961) cites his no. 10006 from Utter Pradesh.

Meherewari (1963) cites his no. 646 from Delhi, where, he says, the species is "A garden shrub, planted in the hedges of gardens for its profusely produced, sweet-smelling flowers and dense foliage" and where it blooms from January to April. He and Singh (1965) list it among the economic plants of India. Sharma (1964) also lists it among the cultivated plants of India. Dakshini (1965) avers that it is "not so common" in dry soil on stony ridges at Dehra Dun. Matthew (1966) reports it from West Bengal. Gupta (1967) describes the corollas as "white-blue" and asserts that the species grows up to 1300 m. altitude in Utter Pradesh. Patzak & Rechinger (1967) list it from Baluchistan (Pakistan), giving its general distribution as simply "Montes Himalaya" and commenting that its occurrence in Iran is questionable. Stewart (1967) cites his no. 27434 from Swat; Sahni (1969) records it from Nafa on the basis of Sahni 5183.

Stewart (1972) cites Aitchison 52, Barrett 97, Fleming 597, HB.18446, and Stewart 27434 from Pakistan (Swat, Poonch, West Punjab, etc.) and notes that it is sometimes cultivated in gardens in Rawalpindi. Babu (1977) cites Babu 33838 from Dehra Dun, where he claims it is common in scrub jungles, forest edges, forest clearings, and secondary forests, flowering from January to June.

Pant and his associates (1981) also encountered it in Uttar Pradesh.

Jafri & Ghaffoor, in a personal communication, cite from Pakistan: Ali 867, Nasir & Ali 5536, Nasir & Siddiqui 370, Saida s.n., and Stewart 10764 from Huzza, Lahore, Rawalpindi, and Swat districts, reporting its overall distribution as "Subtropical or outer Himalaya from Pakistan to Bhutan. Common in the low hills of Punjab, and has also been reported from Baluchistan. Sometimes also cultivated as an ornamental." They give its period of anthesis in Pakistan as February to April. Persa (1949) also lists it from Baluchistan.

Sweet (1826) asserts that Caryopteris odorata was introduced into cultivation in England in 1820 from Nepal. Voigt (1845) lists it as then in cultivation in Calcutta. MacMillan (1943) refers to it as a suitable shrub for arid or sub-desert regions, readily propagated by cuttings. Puri (1960) reports that it was killed or, at least, severely injured in India "by the abnormally excessive frosts of Jan.-Feb., 1905, but in most other years it has been only slightly effected." I personally observed it in outdoor cultivation in Cairo, Egypt, and both my wife and I saw it frequently in gardens in New Delhi in 1973. The material now in the Peredeniya herbarium was cultivated in the Botanical Garden there from seed obtained in Nepal.

Grindal (1960) tells us that there are two distinct types in cultivation in India, both evergreen, one stiff and the other graceful in growth.

It is of interest to note how Indian and Pakistani botanists separate C. odorata from C. foetida, with which it is often confused. According to Parker (1924):

1. Cymes usually forming a terminal thyrsus; fruiting-calyx lobes erect, lanceolate.....C. odorata.
- 1a. Cymes mostly axillary; fruiting-calyx lobes spreading, triangular.....C. foetida.

According to Osmaston (1927):

1. Flowers 0.5--0.6 inch in diameter, in cymes arranged in narrow terminal panicles.....C. odorata.
- 1a. Flowers 0.2 inch in diameter, in axillary cymes, not forming a terminal panicle.....C. foetida.

According to Jafri & Ghaffoor (pers. comm.):

1. Cymes thyrsoid, mostly terminal, elongated; calyx-lobes erect in fruit; capsule pubescent.....C. odorata.
- 1a. Cymes mostly axillary, short; calyx-lobes spreading in fruit; capsule glabrous.....C. foetida.

The Watt (1889) reference in the bibliography of C. odorata is sometimes mis-dated as "1887". Material has often been misidentified and distributed in herbaria as C. grata Benth., C. incana (Thunb.) Miq., C. mastacanthus Schau., Clerodendron infortunatum L., Clerodendron sp., Volkameria serrata Roxb., and Leptotes sp. On the other hand, the Koelz 4399, Ram 2183, and Stewart 16355, distributed as typical C. odorata, actually represent its var.

integifolia Mold., while White 110 is C. foetida (D. Don) Thellung, Smitinand 181 is C. paniculata C. B. Clarke, Mebold 3818 is a mixture with Clerodendrum serratum var. wallichii C. B. Clarke, and Konar 84 is not verbenaceous.

Citations: PAKISTAN: Northwestern States: Ali 867 (Kh); Griffith s.n. [Western Himalayas] (Mu--1127); T. Thomson s.n. [alt. 1-5000 ped.] (Mu--1125, Pd). NEPAL: Gupta 29 (Ca--396217); Herb. Hornemann s.n. [e Nepalia] (Cp); Nicolson 2926 (Mi, W--2571601); Rice 7-78 (W--2848416); Troth 716 (W--2826481). BHUTAN: Falconer 754 (Mu--1175, Pd, S, T); Griffith 6018 (Mu--1128, Ut--69332b). INDIA: East Kashmir: Hügel 1127 (V, V); R. R. Stewart 12075 (N, N). East Punjab: Koelz 4125 (Mi, W--1607985); Shaheen s.n. [30 Jan. 1956] (Go); R. R. Stewart 1560 (S), 2347 (Ba), 7116 (N). Madhya Pradesh: C. B. Clarke 23707 (W--802875). Sikkim: J. D. Hooker s.n. [1-4000 ped.] (Mu--1124, Pd, S); Mebold 3818 in part (S). Siwalik & Jaunsar: Punj 99 (N). Uttar Pradesh: Brandis 1604 (Mu--1154), 1605 (Mu--1155); N. Gill 394 (B); Koelz 19979 (Bv, N); Singh 213 (Ca--361109, La, N); Strachey & Winterbottom s.n. [Kumaon] (Br). West Bengal: C. B. Clarke 26723 (W--803015); Kurz s.n. [Bengal] (Mu--1121); Roxburgh s.n. (Br--isotype, F--photo of isotype, Ld--photo of isotype, N--photo of isotype, Si--photo of isotype). State undetermined: Aitchison s.n. (Pd); T. Anderson s.n. (Br); Ribu & Rhomoo II (Ca--487255). CHINA: Yün-nan: C. K. Schneider 431 (G), 477 (N--photo). CULTIVATED: Burma: O. E. White 110 (N). Egypt: Hassib s.n. [5/4/1928] (Gz), s.n. [17/2/1930] (Gz, Gz, Gz, Gz, Gz, Gz, Gz), s.n. [29/4/1941] (Gz); Mahdi 4 (Gz), s.n. [15/1/1964] (Gz, Gz, Gz). India: Collector undetermined s.n. (Pd); Herb. Hort. Bot. Calcut. 52 (Pd), s. n. (T); Iyer 70 (Au--120934); Krishna s.n. [University Campus, Delhi, 13.12.54] (Dt); Reizede s.n. [Dehra Dun, Jan. 1931] (S), s.n. [New Forest, Feb. 1932] (N); Sabharwal s.n. [1.2.1958] (Kl--4372); Seth s.n. (Tu--147083); Wallich s.n. [H.B.C.] (S). Pakistan: Qureshi s.n. [8.3.1967] (Kh), s.n. [10.3.1967] (Kh, Kh). Sri Lanka: Collector undetermined 125/49 (Pd), s.n. [Students' Garden, R.B.G.] (Pd). Zimbabwe: Fisher s.n. [Govt. Herb. Salisb. 27815] (Rh). LOCALITY OF COLLECTION UNDETERMINED: Collector undetermined s.n. [6th Feb. 1802] (Pd); A. B. Lambert s.n. [1836] (Br). MOUNTED ILLUSTRATIONS: P'ei, Mem. Sci. Soc. China 1 (3): pl. 33. 1932 (Ld).

CARYOPTERIS ODORATA f. ALBIFLORA (Voigt) Mold., Phytologia 22: 6. 1971.

Synonyms: Clerodendron odoratum & albiflorum Voigt, Hort. Suburb. Calc. 466. 1845.

Bibliography: Voigt, Hort. Suburb. Calc. 466. 1845; Parker, For. Fl. Punjab, ed. 2, 404. 1924; H. F. MacMillan, Trop. Plant. Gard., ed. 5, imp. 1, 104 & 204. 1943; Gupta, Season. Fls. Indian Summer Resorts Moos. 67 & 81. 1967; Mold., Fifth Summ. 2: 856, 971, & 972. 1971; Mold., Phytologia 22: 6. 1971; Hocking,

Excerpt. Bot. A.21: 30. 1972; Mold., Biol. Abstr. 54: 6295. 1972; Mold., Phytol. Mem. 2: 347, 387, & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 433. 1983.

This form differs from the typical form of the species in having white corollas.

The form is based on a specimen collected by Joachim Otto Voigt (1798--1843) in the Calcutta Botanical Garden in or before 1845.

Gupta (1967) records the form from Uttar Pradesh, where it occurs up to 1300 m. altitude. Parker (1924) lists it from Punjab. Both Parker and MacMillan (1943) list it as also cultivated in India, where it is propagated by cuttings.

CARYOPTERIS ODORATA var. INTEGRIFOLIA Mold., Phytologia 23: 453. 1972.

Bibliography: Mold., Phytologia 23: 453. 1972; Anon., Biol. Abstr. 56 (30): B.A.S.I.C. S.39. 1973; Mold., Biol. Abstr. 56: 1243. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Mold., Phytol. Mem. 2: 255, 257, 259, & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 433. 1983.

This variety differs from the typical form of the species in having its leaves smaller in size, mostly only 3--4.5 cm. long and 1--2 cm. wide during anthesis, usually entire-margined, and mostly more densely and persistently pubescent beneath and the inflorescence densely congested in all the upper leaf-axils as well as terminal on the stems and branches.

The variety is based on Koelz 4399 from Bhadwar, Kangra, Punjab, India, at an altitude of 2000 feet, collected on May 5, 1933, and deposited in the United States National Herbarium in Washington.

Collectors refer to this plant as a tall woody herb or small shrub with bilaterally symmetric flowers and small leaves. They have encountered it in riverine Bombax-Ceiba-Trewia nudiflora forests at 250--1650 m. altitude, in flower from March to May and in fruit in May. The corollas are said to have been "blue" on Stewart 16355 and Troth 684 and "lavender" on Koelz 4399.

Material of this taxon has been misidentified and distributed in some herbaria as typical C. odorata (Hamilt.) B. L. Robinson or its synonymous C. wallichiana Schau.

Citations: PAKISTAN: Northwestern States: R. R. Stewart 16355 (Ca--972844, N, W--1992163). NEPAL: Troth 684 (N, W--2826480). INDIA: East Punjab: J. R. Drummond 26818 (Ca--244688); Koelz 4399 (Mi--isotype, N--isotype, W--1608133--type). Uttar Pradesh: Bis Ram 2183 (N).

CARYOPTERIS PANICULATA C. B. Clarke in Hook. f., Fl. Brit. India 4: 597--598. 1885.

Synonyms: Clerodendron gratum Kurz ex C. B. Clarke in Hook. f., Fl. Brit. India 4: 597, in syn. 1885 [not C. gratum Benth., 1947, nor Wall., 1829]. Clerodendron grata Kurz ex Collett & Hemsl., Journ. Linn. Soc. Lond. Bot. 28: 111, in syn. 1890. Callicarpa grata Hook. f. & Thoms. ex C. B. Clarke in Hook. f., Fl. Brit. Ind.

dia 4: 597, in syn. 1885. Callicarpa esquirolii Léveillé, Feddes Repert. Spec. Nov. 9: 325 (Esquirol 754). 1911 [not C. esquirolii Léveillé (op. cit. p. 456, Esquirol 72), 1911]. Callicarpa martini Léveillé, Feddes Repert. Spec. Nov. 9: 455. 1911. Caryopteris paniculata (Kurz) Clarke ex P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 176. 1932. Caryopteris paniculatas P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 164, sphalm. 1932. Callicarpa martinii Léveillé ex Mold., Résumé 245, in syn. 1959. Callicarpa paniculata (Kurz) Clarke ex Mold., Résumé Suppl. 14: 7, in syn. 1966 [not C. paniculata Lam., 1785].

Bibliography: Wall., Numer. List 49 [=50], no. 1813. 1829; Kurz, For. Fl. Brit. Burma 2: 268. 1877; C. B. Clarke in Hook. f., Fl. Brit. India 4: 597--598. 1885; Collett & Hemsl., Journ. Linn. Soc. Lond. Bot. 28: 111. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 447 (1893) and imp. 1, 2: 1214. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 178. 1895; Gamble, Man. Indian Timb., ed. 2, imp. 1, 544. 1902; Brandis, Indian Trees, imp. 1 & 2, 512--513 (1906), imp. 2a, 512--513 (1907), and imp. 3, 512--513. 1911; Léveillé, Feddes Repert. Spec. Nov. 9: 325, 455, & 456. 1911; Fedde, Repert. Spec. Nov. 10: 64. 1912; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 319. 1913; Fedde, Repert. Spec. Nov. Gesamtverz. 58. 1914; Léveillé, Fl. Kouy-Tchéou 440. 1915; Fedde, Justs Bot. Jahresber. 39 (2): 1331. 1916; Brandis, Indian Trees, imp. 4, 512--513. 1921; Gamble, Man. Indian Timb., ed. 2, imp. 2, 544. 1922; Chung, Mem. Sci. Soc. China 1 (1): 229. 1924; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, & 176--178, pl. 32. 1932; Junell, Symb. Bot. Upsal. 1 (4): 115 & 118. 1934; Rehd., Journ. Arnold Arb. 15: 326. 1934; Dop in Lecomte, Fl. Gén. Indo-chine 4: 885--886. 1936; Rehd., Journ. Arnold Arb. 18: 243--244. 1937; Fletcher, Kew Bull. Misc. Inf. 1938: 405. 1938; Kanjilal, Das, Kanjilal, & De, Fl. Assam 3: 494 & 496. 1939; Biswas, Indian For. Rec., ser. 2, Bot. 3: 41. 1941; Mold., Suppl. List Inv. Names 2. 1941; Worsdell, Ind. Lond. Suppl. 1: 190. 1941; Mold., Alph. List Inv. Names 12. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 55, 56, 60, & 87. 1942; Erdtman, Svensk Bot. Tidskr. 39: 283--284. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 447 (1946) and imp. 2, 2: 1214. 1946; H. N. & A. L. Mold., Pl. Life 2: 58. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 128, 131, 137, & 178. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Pl. Veg. USSR. 3: 216. 1958; Anon., Kew Bull. Gen. Index 67. 1959; Mold., Résumé 160, 165, 168, 177, 214, 243, 245, 250, 272, & 445. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 447 (1960) and imp. 3, 2: 1214. 1960; Nath, Bot. Surv. South. Shan States 305. 1960; Deb, Bull. Bot. Surv. India 3: 314. 1961; Deb, Sengupta, & Mallick, Bull. Bot. Soc. Beng. 22: 199 & 210. 1968; Mold., Résumé Suppl. 16: 9. 1968; Sahni, Indian For. 95: 346. 1969; Brandis, Indian Trees, imp. 5, 512--513. 1971; Mold., Fifth Summ. 1: 270--272, 282, 287, 294, 356, 408, 414, 415, 423, & 462 (1971) and 2: 856. 1971; Gamble, Man. Indian Timb., ed. 2, imp.

3, 544. 1972; Mold., *Phytologia* 28: 444. 1974; Lauener, *Notes Roy. Bot. Gard. Edinb.* 38: 483. 1980; Mold., *Phytol. Mem.* 2: 256--259, 271, 277, 284, 347, 374, 386, & 529. 1980; Mold., *Phytologia* 52: 429, 433, 453, 466, 467, & 469. 1983.

Illustrations: P'ei, *Mem. Sci. Soc. China* 1 (3): [Verbenac. China] pl. 32. 1932.

A straggling, spreading or "scandent", branching shrub or shrublet, 0.6--2.5 m. tall, or a "shrub-climber"; branches long, terete, flexuous or pendent, slender, pubescent or eventually glabrous; leaves decussate-opposite, odorous when crushed, eventually glabrous; petioles slender, short, 4--7 mm. long, canaliculate, pubescent; leaf-blades membranous, elliptic or ovate to ovate-lanceolate, 7--14 cm. long, 3--6.5 cm. wide, apically obtusely acuminate, marginally crenate or dentate, basally cuneate or usually obtuse to rounded, at first pubescent but glabrate when mature; secondaries about 5 per side; inflorescence axillary, small, densely many- [often 20--60-] flowered, subsessile, 1.2--3.7 cm. long, reddish, distinctly paniculate or thyrsoid or eventually glabrate, much shorter than the subtending leaves; peduncles, when present, dark-purple; rachis distinct; bracts and bractlets minute; inflorescence-branches purple; flowers small, scented, very short-pedicellate or sessile, arranged in cymules on raceme-like, one-sided, horizontally spreading or recurved, puberulous panicles; calyx about 2 mm. long, externally puberulent or glandular-hairy, 5--7-toothed, the teeth very small, lanceolate, apically subulate or long-acuminate; corolla deep-red or pinkish-purple to violet or lilac, 3--8 mm. long, about 3 times as long as the calyx, 5-lobed, externally pubescent, the tube often white, the lower lip apically entire or crisped; stamens 4, exserted; anther thecae apically divergent; style exserted; ovary externally pubescent; fruiting-calyx hardly accrescent, its segments small, lanceolate; fruit capsular, green, globose, about 2 mm. long and wide, externally pubescent and glandulose.

This species is apparently based on a J. D. Hooker collection from eastern Nepal and Griffith 6044 from Mishmee, both deposited in the Kew herbarium. Clarke (1885) also notes "Distrib. Ava" [Burma]. Fletcher (1938) asserts that the "type" is from Burma, but this is certainly incorrect.

Callicarpa martini is based on L. Martin 2562 from "Kouy-Tchéou; Environs de Hoang-Ko-chou, bord du gave", collected in February of 1899 and deposited in the Edinburgh herbarium. Callicarpa esquirolii is based on J. Esquirol 754, also from Kweichow, but mis-cited by Léveillé (1915) as no. "654". The homonymous C. esquirolii, based by Léveillé on J. Esquirol 72, is Dichroa febrifuga Lour. in the Hydrangeaceas.

Collectors have found Caryopteris paniculata growing in light shade of roadside thickets, in open places on limestone ridges, scattered in the shade of hill forests, in bamboo-rich evergreen forests on limestone, and among secondary vegetation in evergreen forests on weathered granite, at 350--2553 m. altitude, in flower in January, March, April, October, and December, and in fruit in

January and March. Kingdon-Ward reports it "common in dense secondgrowth on old cultivated sites" in the Mishmi hills.

The corollas are said to have been "purple" on Shimizu & al. T.11773, "purplish" on Smitinand 181, "dull-purplish" or "crimson-purple" on Kingdon-Ward 18443, "reddish-purple" on Rock 7832, "lilac" on Henry 10408b, "whitish with a crimson lip" on Stewart 25556, "tube white, lobes pink" on Geesink & al. 8148, and "tube white, lobes violet" on Geesink & al. 8262.

Clarke (1885) remarks concerning this plant: "Otherwise much resembling *C. grata*; the whole panicle usually is red; but in *C. grata* it is often more or less red." He gives its general distribution as frequent in the subtropical forests of the Himalayas, at altitudes of 1000--4000 feet, of eastern Nepal to Burma. Kurz (1877) lists it from Ava and the Kakhya hills of Burma. Brandis (1906) gives its natural range as the "Outer eastern Himalaya to 6,000 feet, Assam, Manipur, Lushai hills, Shan hills, 5,000 ft., Hills east of Bhamo 4,000 ft., Yunnan 5-6,000 ft." Collett & Hemsley (1894) also list it from the Shan Hills plateau of Burma, at 5,000 feet altitude. Fletcher (1938) cites Kerr 3137 from Thailand, as well as crediting it to Burma and Yünnan (China).

P'ei (1932) cites only Martin 2562 from Kweichow and Forrest 9579 and Henry 10408a, 10408b, & 10408c from Yünnan -- he comments that "This species was erroneously characterized by Léveillé as *Callicarpa martini* who failed to observe the structure of the fruit. In vegetative characters and in general appearance it very much resembles *Callicarpa*, but it is easily distinguished by its dehiscent fruit and paniculate inflorescences. I find no essential difference between the Chinese and Indian specimens. It is distinguishable from all other species of the genus by its inflorescences, which are reddish and paniculate rather than cymose."

Rehder (1934, 1937) cites Esquirol 304 & 754 and Martin 2562 from Kweichow. He notes that "P'ei....cited *Caryopteris paniculata* C. B. Clarke with the parenthetical author '(Kurz)' which is apparently an error, since *C. paniculata* is a new name, not a new combination, and is based on *Clerodendron* Kurz, not. Wall."

Das and his associates (1939) list *C. paniculata* from Assam, the "N. E. F. Tract", Manipur, the Lushai Hills, and Mishmi Hills. Nath (1960) records it from the Southern Shan States of Burma, while Deb (1961) cites his no. 597 & 1885 from Manipur. The same author and his associates (1963) record it from Bhutan, where, they assert, it occurs 'scattered' and serves as a fodder plant, growing from 1050 to 1650 m. altitude, citing Deb 53 and Sengupta 975, 1005, & 1151. Sahni (1967) cites his no. 5164.

The *Clerodendron gratum* of Bentham and of Wallich, mentioned in the synonymy (above), belong in the synonymy of *Caryopteris foetida* (D. Don) Thellung.

Junell (1934), on the basis of Henry 10408 in the Kew herbarium, says that the fruit of *C. paniculata* separates on maturity

into 4 nutlets, lying close together, and together forming a spherical fruit.

Erdtman (1945) classified C. paniculata in the same group of the genus with C. chosenensis, C. nepetaefolia, C. odorata, and C. siccanea. He describes its pollen grains as tricolporate and subprolate.

The Callicarpa paniculata of Lamarck (1785) referred to in the synonymy (above), is a synonym of Chilanthes arborea (L. f.) Benth. in the Logeniaceseae. The Clerodendrum gratum of Wallich (1829), also listed in the synonymy (above), is based on Wallich 1813 from Dehra Dun, India, collected in 1825 and deposited in the East India Company herbarium at Kew. Wallich remarks of it: "C. odorata affinis".

Lauener (1980) calls attention to the fact that the "later Callicarpa esquirolii [of Léveillé], renamed Callicarpa leveilleana by Fedde, is Dichroa febrifuga Lour.....P'ei realised this but also confused them, [erroneously] relating the earlier C. esquirolii to Dichroa", while actually it is the one that is Caryopteris paniculata.

Material of Caryopteris paniculata has been misidentified and distributed in some herbaria under such names as C. grata Benth., C. grata Benth. & Hook. f., C. odorata (Hamilt.) B. L. Robinson, Callicarpa sp., Canthium sp., and Floscopia sp.

Citations: PAKISTAN: Northwestern States: T. Thomson s.n. [3-6000 ped.] (Mu--796). Poonch: R. R. Stewart 25556 (Kh, N). BHUTAN: W. Griffith 6044 (Mu--972--cotype, Mu--1679--cotype); J. Parkes s.n. [1885] (W--209330). INDIA: Sikkim: Craib 494 (Bz--18710); T. Thomson s.n. [Sikkim] (Bz--18705). Uttar Pradesh: Brandis 1603 (Mu); R. R. Stewart 14864 (N, W--1941708), 15776 (Ca--972845, N). BURMA: Upper Burma: Kingdon-Ward 18443 (N). CHINA: Yünnan: Esquierol 754 (N--photo); A. Henry 10408a (N, N), 10408b (N), 10408c (W--457823); Rock 7832 (W--1758288). THAILAND: Bunchai 62 (Ac); Geesink, Hespko, & Phengklai 8148 (Ac), 8262 (Ac); Koyama, Phengklai, Niyondham, Iamura, Okada, & O'Connor 15621 (Ac, N); Shimizu, Iwatsuki, Fukuoka, Hutch, Chaiglom, & Nalampoon T.11773 (Ac); Smitinand 181 [Herb. Roy. For. Dept. 4802] (Ld). CULTIVATED: India: Herb. Hort. Bot. Calcutt. s.n. (Bz--18711). MOUNTED ILLUSTRATIONS: P'ei, Mem. Sci. Soc. China 1 (3): pl. 32. 1932 (Ld).

CARYOPTERIS SICCANEA W. W. Sm., Notes Roy. Bot. Gard. Edinb. 10: 18. 1917.

Synonymy: Caryopteris siccanea W. W. Sm. apud P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 180 sphalm. 1932.

Bibliography: W. W. Sm., Notes Roy. Bot. Gard. Edinb. 10: 18. 1917; A. W. Hill, Ind. Kew. Suppl. 6: 38. 1926; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, 178, & 180. 1932; Fedde & Schust., Justs Bot. Jahressber. 60 (2): 571. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 56 & 87. 1942; Erdtman,

Svensk Bot. Tidsk. 39: 283--284. 1945; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131 & 178. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR. 3: 216. 1958; Mold., Résumé 168 & 445. 1959; Mold., Fifth Summ. 1: 287 (1971) and 2: 856. 1971; Mold., Phytol. Mem. 2: 277 & 529. 1980; Mold., Phytologia 52: 433 & 434. 1983.

Plants 60--75 cm. tall; stems angulate, spreading-hirsute, glandulose; leaves decussate-opposite; petioles to 7.5 cm. long, glandular-hirsute; leaf-blades thin-membranous when dry, broadly ovate, to 8 cm. long and 7 cm. wide, apically acute and mucronate, marginally coarsely serrate-incised with about 12 coarse ovate teeth on each side, basally cordate, more or less densely appressed-whitish-setose on both surfaces; inflorescence similar to that of *C. chosenensis* Mold. in form and size but narrower; peduncles, pedicels, and inflorescence-axis and -branches very densely hirsute and pilose with fulvous glandular-capitate hairs; bracts lanceolate or linear-lanceolate, less than 1 cm. long, somewhat decreasing in size upwards; calyx 4--5 mm. long, externally glandulose and hirsutulous (except for the base), bilabiate to about the middle, the upper lip 3-fid, the lower bifid; corolla similar to that of *C. chosenensis*, white, externally pilosulous; stamens exserted about 1.5 cm. from the mouth of the corolla-tube; style subequaling the stamens, apically bifid, the branches rather long and subulate; immature fruit rather fleshy.

This species is based on *G. Forrest* 12746 from open, dry, rocky pastures at lat. 26°45' N. in the Yung-pe mountains, altitude 9000 feet, Yün-nan, China, collected in June, 1914, and deposited in the Edinburgh herbarium. Smith (1917) asserts that the "Species valde affinis *C. divaricatae*, Maxim. a qua foliis cordatis utrinque longiusculae setulosis, caulinis et inglorcentiae ramulis et pedunculis et pedicellis densissime glandulosis et hirsutis, floribus albis, calyce irregulari differt."

Erdtman (1945) asserts that the species belongs in the same natural group in the genus as *C. chosenensis* Mold., *C. nepetaefolia* (Benth.) Maxim., *C. odorata* (Hamilt.) B. L. Robinson, and *C. paniculata* C. B. Clarke.

Neither P'ei (1932) nor I have seen any material of this taxon.

CARYOPTERIS TERNIFLORA Maxim., Bull. Soc. Nat. Mosc. 54: 40--41. 1879.

Synonymy: *Ocimum aureoglandulosum* Van., Bull. Acad. Géog. Bot. 14: 171--172. 1904. *Caryopteris ternifolia* Maxim. ex Mold., Résumé 250, in syn. 1959.

Bibliography: Maxim., Bull. Soc. Nat. Mosc. 54: 40--41. 1879; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 265. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 447. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 178. 1895; Diels, Fl. Cent.-China 550. 1902; Van., Bull. Acad. Géog. Bot. 14: 171--172. 1904; Prain, Ind. Kew. Suppl. 3: 120. 1908; Dunn, Notes Roy. Bot. Gard. Edinb. 8: 154. 1913; Anon.,

Notes Roy. Bot. Gard. Edinb. 17: 12. 1929; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, & 174--176. 1932; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 56 & 87. 1942; Erdtman, Svensk Bot. Tidsk. 39: 283--284. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 447. 1946; P'ei, Bot. Bull. Acad. Sin. 1: 6--7. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131 & 178. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR. 3: 216. 1958; Mold., Résumé 168, 250, 322, & 445. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 447. 1960; Mold., Fifth Summ. 1: 287 & 423 (1971) and 2: 575 & 856. 1971; Lauener, Notes Roy. Bot. Gard. Edinb. 38: 483. 1980; Mold., Phytol. Mem. 2: 277 & 529. 1981; Mold., Phytologie 52: 433 & 435. 1983.

A pubescent or cinerascent-villous, many-stemmed, low shrub or subshrub, about 45 cm. tall or usually smaller; stems subsimple; leaves decussate-opposite, short-petiolate; petioles 2--6 mm. long, pubescent; leaf-blades chartaceous, lanceolate-oblong to ovate or deltoid, 1.5--3.5 [rarely 4] cm. long, 1--2.5 cm. wide, apically obtuse or acute, marginally serrate with 6--10 large acute teeth per side, basally subcordate or truncate, pubescent and glandulose on both surfaces; secondaries about 6 per side; inflorescence axillary, in all the leaf-axils almost to the base of the stems, equaling the subtending leaves, bracteate, the cymes 3--few-flowered; peduncles 2-bracteate or bractediate at about the middle; pedicels subequaling or longer than the calyx; calyx 4- or 5-lobed or -fid, pubescent and sparsely glandulose on both surfaces, the lobes unequal, apically acuminate and mucronate, about 1.6 cm. long, the upper 2 or 4 smaller and shorter, obovate, externally pilose, the 5th (lower) larger, 3--5.5 mm. long, rotund, unguiculate; stamens 4, inserted near the mouth of the corolla-tube, long-exserted, incurved, surpassing the pistil, about twice as long as the corolla, glabrous above, basally pilose; anther thecae divaricate; style long-exserted, apically bifid, glabrous, the branches acuminate; ovary externally densely villous; fruiting-calyx scarcely enlarged, about 7 mm. long or twice as long as the fruit; fruit about 3 mm. long, the valves coriaceous, obovoid, deeply navicular, externally densely short-hispid or hirsute dorsally, the ventral areole shorter, depressed; seed attached below the apex of a pseudo-septum, obovate; gynobase convex; embryo flat; cotyledons 2, rotund-ovate; radicle inferior.

This species is based on 2 unnumbered Piasezki collections from dry hills along the Han river in Shensi, western China, collected on April 11, 1875, and in far southern Kansu, collected on June 11 of the same year, both deposited in the Moscow herbarium. Maximowicz (1879), comparing this species with C. nepetaefolia (Benth.) Maxim., notes "Etiam haec spec. fructu cerant, ita ut diagnosin.. a me datam completam facere nequeam. Sed ante oculos est congener. junctionem Teucrii nepetaefoliae Bth. cum Caryopteride probans, inter illam et C. divaricata m. fere media: Caryopteris ternifloraHabitu, pube, inflorescentia (tamen 3-flora) et corolla C. nepetaefolia, stylus C. divaricatae, fructus C. incanae Miq., sed pseudo-septum non circumcircum, sed uno latere solutum, ut in C.

mongolica, calyx etiam ultimorum duarum."

Forbes & Hemsl. (1890) aver that C. terniflora is "Very variable in the inflorescence, the cymes being from two- to many-flowered and distinctly peduncled or almost sessile. Perhaps this should be included under C. nepetaefolia, Maxim., to which Mr. Franchet refers specimens collected by Father David." They cite Faber s.n. from Kiangsi, David s.n. and Henry 336, 336a, 855, 1230, 2038, 2726, & 7776 from Hupah, and Piasezki s.n. from Shensi and Kansu. P'ei (1932) cites Henry 7776, Silvestri 1960, and Wilson 80 & 1772 from Hupah, Giraldi s.n. from Kansu, and Forrest s.n. from Yünnan. He comments that "The reduction of Ocimum multiglandulosum Van. by Dunn was based on the examination of the type specimen."

P'ei (1947) records C. terniflora from Sikiang. Diels (1902) cites only unnumbered collection of He and of Piasezki from what he refers to as central China. Lauener (1980) cites Bodinier 1533 from Kweichow -- the type collection of Ocimum multiglandulosum Van. -- described as having been found "entre Hin y hien et Trou, bordes d'une petite rivière profondément encaissée, quai du pont, plante herbacée ou sous-ligneuse, quelquefois très branchée, fleurs bleu pâle, 12 IV 1897."

Erdtman (1945) places this species in the same natural group in the genus as C. chosenensis Mold., C. nepetaefolia (Benth.) Maxim., C. odorata (Hamilt.) B. L. Robinson, C. paniculata C. B. Clarke, and C. siccanea W. W. Sm. Like those of C. nepetaefolia, its pollen grains are tricolpate, spheroidal, and with scattered spines.

Collectors have encountered C. terniflora at 800 m. altitude, in flower from April to June. Chow refers to it as a "vine". Material has been misidentified and distributed in some herbaria as the very similar C. nepetaefolia.

Citations: CHINA: Hupah: Chow 587 (N); A. Henry 7776 (W--802145); Silvestri 1960 (Ca--387891, N); E. H. Wilson 80 (W--596310), 1772 (N). Kiangsi: A. Henry 686 (N, N--photo). Shensi: Giraldi s.n. [Lao-y-san, 11 Guigno 1897] (Ca--387855). Szechuan: Fang 70 (W--1626745). Yünnan: Forrest 13703 (Ba), 16243 (S).

CARYOPTERIS TRICHOSPHAERA W. W. Sm., Notes Roy. Bot. Gard. Edinb. 10: 18. 1917.

Bibliography: W. W. Sm., Notes Roy. Bot. Gard. Edinb. 10: 18. 1917; A. W. Hill, Ind. Kaw. Suppl. 6: 38. 1926; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, & 171--173. 1932; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 571. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 56 & 87. 1942; Erdtman, Svensk Bot. Tidskr. 39: 283 & 284. 1945; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131 & 178. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR. 3: 216. 1958; Mold., Résumé 168 & 445. 1959; Mold., Fifth Summ. 1: 287 (1971) and 2: 856. 1971; Mold., Phytol. Mem. 2: 277 & 529. 1980; Mold., Phytologia 52: 433, 434, 469, 471, 488, & 490. 1983.

A small, aromatic, bushy undershrub, 0.4--1.2 m. tall; branch-

lets densely whitish- and crisped-tomentose; leaves decussate-opposite, strongly aromatic, glutinous; petioles 2--6 mm. long, whitish-tomentose; leaf-blades chartaceous, ovate or broadly o-vate to oblong-ovate, to 3 cm. long and 2.5 cm. wide, apically rounded or subobtuse to obtuse, marginally coarsely serrate or crenate with 6--9 teeth, basally truncate or rounded-truncate, densely short-pilosulous with fulvous hairs above, very densely incanous-tomentose beneath, glandulose on both surfaces; secondaries 4 or 8 per side, prominent beneath; cymes subglobose, densely flowered, borne in the upper leaf-axils, densely white-villous; peduncles and pedicels short; calyx tubular, about 4 mm. long, externally long-villous with white hairs, glandulose, biparted, the lobes linear-oblong, apically acute; corolla blue or blue-violet to white, about 6 mm. long, 5-lobed, the tube cylindric, almost 5 mm. long, externally villous, internally pubescent, the upper 4 lobes oblong, apically densely long-villous with violet hairs, the lower (5th) lobe larger, apically fimbriate; stamens exserted about 4 mm. or twice as long as the corolla-tube; filaments glabrous except for the villous insertion area; style glabrous; stigma bifid; ovary externally glabrous; capsule ovoid, about 3 mm. long and 2 mm. wide, externally glabrous.

This species is based on F. Kingdon-Ward 1048 from near Atuntsu on the Yünnan-Tibet boundary, at 12000--13000 feet altitude, collected in August, 1913, and deposited in the Edinburgh herbarium.

Collectors have encountered this plant in alpine meadows and on stony shrub-clad mountain slopes, at 3100--4000 m. altitude, in flower in July and August and in both flower and fruit in September. The corollas are described as having been "bluish" or "blue" on Rock 10013 and "white or very pale blue" on Forrest 19722.

P'ei (1932) cites Forrest 14477 & 19722 and Rock 10013 from Yünnan and notes that "This species is separated from other species of Caryopteris [sic] by the long hairs on the outside of the corolla tube and by both surfaces of the leaves being densely glandular, giving them a glutinous appearance." This condition is also seen in C. glutinosa Rehd.

Smith (1917) avers that C. trichosphaera differs from C. incana (Thunb.) Miq. in the long-villous upper corolla-lobes and "in other ways".

The Rock 23351 collection, cited below and determined as this species "vel eff." by Rehder has leaves very much like those of C. nepetaefolia Maxim. and C. terniflora Maxim. and may not actually belong here.

Erdman (1945) places C. trichosphaera in the same natural group in the genus as C. forrestii Diels, C. glutinosa Rehd., C. incana (Thunb.) Miq., and C. mongholica Bunge. He asserts that "On pollenmorphological as well as on other evidence, Amethystea coerulescens L....ought to be closely related with and, consequently,

placed in the same family as Caryopteris nepetaefolia and C. terniflora."

Material of C. trichosphaera has been misidentified and distributed in some herbaria as C. incana (Thunb.) Miq. and as C. tangutica var. brachyodonta Hand.-Mazz. (this latter by Handel-Mazzetti himself).

Citations: CHINA: Sikiang: W. W. Smith 12243 (s). Yunnan: Rock 10013 (Ca--282184, N--photo, W--1213466), 23351 (Ca--517075, N, W--1512910).

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ADDITIONAL NOTES ON THE ERIOCaulaceae. LXXXV

Harold N. Moldenke

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ERIOCAULACEAE Lindl.

Additional synonymy: Eriocælaciae Auct. anon., in herb.

Additional & emended bibliography: L., Mant. Pl. 2: 107 & 167. 1771; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 206. 1791; Hedw., Gen. 51 & 365. 1806; R. Br., Prodr. Fl. Nov. Holl., imp. 1, 1: 252--255. 1810; Nees in R. Br. Fl. Nov. Holl. 1:109. 1810; Roxb., Hort. Beng., imp. 1, 68. 1814; Kunth, Syn. 1: 262. 1822; Blume, Cat. Gewass., imp. 1, 35. 1823; A. L. Juss in Cuvier, Dict. Sci. Nat. 45: 272. 1827; Reichenb., Conspl. Reg. Vég. 1: 28 & 58. 1828; Dumort., Anal. Fam. 54--55. 1829; Link, Handb. 1: 135. 1829; Bartl., Ord. 36. 1830; Loud., Hort. Brit., ed. 1, 36--37 & 541. 1830; Sweet, Hort. Brit., ed. 2, 597 & 607. 1830; Ritg., Marb. 2: 120. 1831; Bong., Mem. Acad. Imp. Sci. St.-Pétersb., ser. 6, 1: 1--74 & 601--656, pl. 1--19 & 39. 1831; Loud., Hort. Brit., ed. 2, 36--37 & 541. 1832; Lindl., Nix. Pl. 36. 1833; Mart., Nov. Act. Acad. Leopold.-carol. Nat. Cur. 17 (1): 3, 7, 13, & 71. 1835; G. Don in Loud., Hort. Brit., ed. 3, 36--37, 469, 541, 588, & 633. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 719. 1839; Endl., Enchirid. Bot. 67--68. 1841; Kunth, Bericht. Akad. Berl. 110. 1841; Reichenb., Nom. 42. 1841; Endl., Enchirid. Bot. Suppl. 2: 12. 1842; Brongn., En. Genr. 12. 1843; Meisn., Pl. Vasc. Gen. 2: 312. 1843; Spach, Hist. Vég. Phan. 13: 140. 1846; A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 12: 417. 1849; Lemaire in Orbigny, Dict. Univ. Hist. Nat. 5: 397. 1849; Lindl., Veget. Kingd., ed. 3, 122, 797, 802, 818, & 830, fig. 82. 1853; Miq., Fl. Ind. Bat. 3: 523. 1857; Miq., Fl. Ind. Bat. Suppl. 1: 268. 1860; Lindl. & Moore, Treas. Bot., ed. 1, 1: 462 (1866) and ed. 2, 1: 462. 1870; Ulrich, Internat. Wörterb., ed. 1, 83. 1871; Pfeiffer, Nom. Bot. 1 (2): 1150, 1239--1240, & 1861 (1874), 2 (1): 5 (1874), and 2 (2): 914. 1874; Ulrich, Internat. Wörterb., ed. 2, 83. 1875; Lindl. & Moore, Treas. Bot., ed. 3, 1: 462. 1876; J. G.

Baker, Journ. Linn. Soc. Lond. Bot. 20: 237. 1883; Lindl. & Moore, Treas. Bot., ed. 4, 1: 462. 1884; Van Tiegh., Journ. de Bot. 1: 305--315. 1887; Durand, Ind. Gen. Phan. 454. 1888; Engl., Bot. Jahrb. 9: Übersicht 78. 1888; Henslow, Journ. Linn. Soc. Lond. Bot. 29: 488. 1893; Lindl. & Moore, Treas. Bot., ed. 5, 1: 462. 1899; J. C. Willis, Dict. Flow. Pl., ed. 2, 368 & 498. 1903; Post & Kuntze, Lexicon 623. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 483. 1906; Pobéguin, Pl. Méd. Guin. 199--200. 1906; Le-comte, Notul. Syst. 1: 188 & 191--192. 1909; Ruhl., Wiss. Ergebn. Deutsch. Zentralaffr. Exped. 2 (1): 57--58. 1910; Domín, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 246--248. 1911; Lotsy, Vortr. Bot. Stammesges. 3 (1): 641, 705--709, 711, & 964, fig. 479--482. 1911; Nakai, Bot. Mag. Tokyo 25: [209]--[221], fig. 1 & 2. 1911; Craib, Kew Bull. Misc. Inf. 1912: 421. 1912; E. D. Merr., Philip. Journ. Sci. Bot. 7: 155. 1912; C. B. Robinson, Philip. Journ. Sci. Bot. 7: 415. 1912; Ruhl. in Urb., Symb. Antill. 7: 173. 1912; Wangerin, Justs Bot. Jahresber. 39 (1): 474. 1912; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 10. 1913; Höck, Justs Bot. Jahresber. 39 (1): 965, 966, & 1016. 1913; Wangerin, Justs Bot. Jahresber. 39 (1): 506 & 550 (1913) and 40 (1): 557. 1913; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 10 (1913) and 40 (2): 15. 1914; Höck, Justs Bot. Jahresber. 40 (1): 1067. 1914; Thonner, Flow. Pl. Afr. 121, pl. 15. 1915; Fedde, Justs Bot. Jahresber. 39 (2): 1386. 1916; Fyson, Journ. Indian Bot. 2: 133--150, 192--208, 259--266, & 307--320, fig. 5 & 8, pl. 1--10. 1921; Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 159--171, pl. 1--5. 1921; Arber, Bot. Gaz. 74: 80, 84, 88, 91, & 94, pl. 2, fig. 19. 1922; Mak., Illust. Fl. Jap. [723] & [724]. 1924; Arber, Monocot. 88, 211, & 251, fig. 66. 1925; J. C. Willis, Dict. Flow. Pl., ed. 5, 84, 359, 376, 421, 481, 635, & 654. 1925; Correa, Dicc. Pl. Uteis Bras. 1: 349. 1926; Itô, Taiwan Shokubutsu Dzusetsu [Illust. Formos. Pl.] pl. 847 & 848. 1927; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 179--183. 1927; Chiov., Fl. Somala 41. 1929; Mayurathan, Bull. Madras Govt. Mus., ser. 2, pl. 38. 1929; C. A. Gardn., Enum. Pl. Austral. Occid. 1: 17. 1930; C. T. Stevens, Illust. Flow. Pl. Midd. Atl. N. Eng. St. pl. 9. 1930; Komarov & Klobukova-Alisova, Key Pl. Far East. USSR [Oprad. Rast. Dal'novost. Kr.] 1: 340, pl. 105. 1931; Stepf, Ind. Lond. 6: 248, 316, 554, & 565. 1931; Vasinger-Alektorova, Bull. Appl. Bot. Leningrad 25 (4): 121. 1931; Fyson, Fl. S. Indian Hill Stat. 2: 565. 1932; Van Steenis & Ruttner, Pterid. Phan. Deutsch. Limnol. Sunda-Exped. [Arch. Hydrobiol. Suppl. 11.] pl. 53. 1932; Ishido, Chines. Drog. 1: 16 & 17. 1933; Mak., Gensyoku Yagai-shokubutsu [Nature-Col. Wild Pl.] 3: 173 & 184. 1933; Terasaki, Nippon. Shokubutsu Zuku [Jap. Bot. Illust. Album] 1845 & 1846. 1933; A. Chev., Rev. Bot. Appl. Agric. Trop. 15: 1027. 1935; Bedavian, Illust. Polyglot. Dict. 260. 1936; Mak., Illust. Fl. Nipp. 771--772, fig. 2311--2316. 1940; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 286. 1941; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 483. 1941; Ref., Autikon Bot., imp. 2, 188 & 189. 1942; Savage, Cat. Linn. Herb. Lond. 21. 1945; Blume, Cat. Ge-

wess., imp. 2, 35. 1946; Lawrence, Taxon. Vasc. Pl., imp. 1, 404--405, 792, 800, & 818, fig. 83. 1951; J. C. Willis, Dict. Flow. Pl., ed. 6, 84, 376, 481, 521, 635, & 654. 1951; Stachurska, Wszachswiat 7: 189--194. 1955; Erdtman, Revist. Fac. Cienc. Agrar. Mend. 6: 39--51. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 483. 1959; Van Steenis-Kruseman, Fl. Males. Bull. 15: 757. 1960; F. H. Wang, Pollen Gr. China 1960; Beadle, Evans, & Carolin, Handb. Vasc. Pl. Sydney Dist. 483. 1962; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 138, 168, 202, 223, 224, 268, 349, 385, 396, 417, 418, 483, 611, 620, 633, 647, 758, 821, 950, 956, 1057, 1091, 1092, 1095, 1129, & 1197. 1966; Goudet-Ducallier, Research. Palynol. Pl. Hygroph. [D.E.S. Fac. Sci. Univ. Dij.] 1--59. 1967; Bennett, Sci. Cult. 33: 121. 1967; Kapp, How Know Pollen Spores 92 & 222, fig. 182. 1969; Tomlinson in Metcalfe & Chalk, Anat. Monocot. 3: 158. 1969; Huang, Taiwania 15: 152--153. 1970; Rouleau, Guide Ind. Kew. 26, 31, 36, 39, 40, 44, 48, 59, 66, 68, 71, 73, 96, 103, 105, 109, 110, 120, 127, 138, 145, 160, 161, 164, 177, 180, 183, 189, 200, & 270. 1970; Balapure, Journ. Bomb. Nat. Hist. Soc. 68: 374. 1971; Lawrence, Taxon. Vasc. Pl., imp. 2, 404--405, 792, 800, & 818, fig. 83. 1971; McClinton & Fitter, Collins Pock. Guide Wild Fls., pl. 66, fig. 955. 1971; T. B. Muir, Muelleria 2: 140. 1972; Soerjan in Vanshney & Rzóska, Aquat. Weeds S. E. Asia 64. 1973; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 12 (2): 50 & 81. 1973; L. H. & E. Z. Bailey, Hortus Sac., imp. 18, 286. 1974; Hocking, Excerpt. Bot. A.23: 290--293, 314, 388, & 389. 1974; León & Alain, Fl. Cuba, ed. 2, 1: 275, 278--284, 423, 426, 428, & 435--436, fig. 112 & 113. 1974; Napp-Zinn, Anat. Blatt. A (1): 168, 228, 247, 360, 555, & 673. 1974; Asher, Guide Bot. Period. 1: 720. 1975; Galvão & Cavalcante, Bol. Mus. Para. Goeldi, ser. 2 Bot., 1--40 Ind.: 3, 14, & 15. 1975; Rotherham, Briggs, Blaxell, & Carolin, Flow. Pl. N. S. Wales 50 & 187, pl. 121. 1975; Arekal & Ramaswamy, Proc. 63rd Ind. Cong. 3 (6): 85. 1976; L. H. & E. Z. Bailey, Hortus Third 440. 1976; Bennett, Fl. Howrah 15 & 98. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: 23--30. 1976; Srivastava, Fl. Gorak. 331. 1976; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Tech. 13: 91, 129, 132, 150, 172, 180, 229, 236, 285, & 384. 1976; Amarasinghe, Ceyl. Journ. Sci. Biol. 12: 189. 1977; Babu, Herb. Fl. Dehra Dun 13, 17, 26, 39, & 546--548. 1977; Bois & Almeida, Journ. Bomb. Nat. Hist. Soc. 74: 226--227. 1977; Chin, Gard. Bull. Singapore 30: 187. 1977; LaTorre, Ortega, & Inca, Cienc. Naturaleza 18: 62. 1977; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awaren. 8: 33 (1978), 9: 23 & 33 (1978), and 10: 27. 1978; Cheng, Fl. Taiwan 5: [179]--188. 1978; C. D. Cook in Heywood, Flow. Pl. World 281--282. 1978; Giul., Bol. Bot. Univ. S. Paulo 6: 39--47, fig. 1 & 2, & [61]--65. 1978; Haslam, River Pl. 287. 1978; Hocking, Excerpt. Bot. A. 31: 16--18. 1978; Johnson & Fowles, Heritage Me. Wild Fls. 66, 67, 226, 296, & 311. 1978; Monteiro-Scanavacca & Mazzoni, Revist. Bras. Bot. 1: [59]--64, fig. 1--12. 1978; Moore & Webb, Illust. Guide Pollen Anal. 36 & 56, pl. 15. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 57. 1978; Rao & Khark., Journ. Bomb.

Nat. Hist. Soc. 75: 275 & 279. 1978; Sharma, Shetty, Vivekan., & Rathakrish., Journ. Bomb. Nat. Hist. Soc. 75: 38. 1978; Singh, Journ. Bomb. Nat. Hist. Soc. 75: 318. 1978; E. B. Sm., Atlas Annot. List, imp. 1, 421. 1978; R. J. & C. S. Taylor in R. J. Taylor, New Rare Infr. Coll. Pl. [Herb. SE. Okla. St. Univ. Publ. 2:] 44--46, 85, 100, & 101, fig. 4. 1978; Ajilvsgi, Wild Fls. Big Thicket 59 & 107--108. 1979; Anon., Biol. Abstr. 68: 4592. 1979; Anon., Roy. Bot. Gard. Kew Lib. Curr. Awarens. 2: 28 & 39. 1979; Benson, Pl. Classif., ed. 2, 364 & 373. 1979; Cronquist, How Know Seed Pl. 124--125, fig. 265. 1979; Davis & Cullen, Ident. Flow. Pl. Fam., ed. 2, 25, 54, & 91. 1979; Erickson, George, Merchant, & Morcombe, Fls. Pl. West. Austr., ed. 2, 176, 219, & 225, pl. 565. 1979; Hocking, Excerpt. Bot. A.33: 5, 87, 89, & 165. 1979; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Jones & Luchsinger, Pl. System. 100, 103, & 359. 1979; Klein, Sellowia 31: 42 & 132. 1979; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 503--530, fig. 293--307. 1979; Mold., Phytologia 41: 409--430, 451--485, 504--506, & 511 (1979), 42: 29--44, 199--208, 506, 507, & 509--511 (1979), 43: 196--197, 222, 503, 508, & 511 (1979), and 44: 123, 134, 215--216, 384, 507, 509, & 511. 1979; Monteiro, Giul., Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43]--59. 1979; Pursh, Fl. Amer. Sept., imp. 2 [ed. Edwan], 91--92. 1979; Rizzini, Trat. Phytoesog. Bras. 2:141, 206, 208, 292, 293, 314, & 341, fig. 49. 1979; Rogerson, Becker, Long. & Prince, Bull. Torrey Bot. Club 106: 247. 1979; E. B. Sm., Atlas Annot. List, imp. 2, 421. 1979; Van Royen, Alpine Fl. N. Guin. 1: 208, 211, & 213, fig. 48 (1979) and 2: 823--843. 1979; Weberling & Schwantes, Pflanzensyst., ed. 3, [Uni-Taschenb. 62:] 158. 1979; Wherry, Fogg, & Wahl, Atlas Fl. Penna. 93. 1979; N. H. Williams, Journ. Linn. Soc. Lond. Bot. 78: 63. 1979; Zander & Pierce, Bull. Buffalo Soc. Nat. Sci. 16 (Suppl. 2): 10, 40, & 92. 1979; Anon., Ann. Mo. Bot. Gard. 67: xxvi & xxxii. 1980; Avery & Loops, S. Fla. Res. Cent. Rep. T-574: 7. 1980; Barry, Nat. Veg. S. Carol. 163. 1980; Brickell, Cutler, & Gregory, Linn. Soc. Sympos. ser. 8: 193. 1980; Campbell & Eastman, Life Sci. Agr. Exp. Sta. Orono Tech. Bull. 99: [Fl. Oxford Co.] 93--94. 1980; Chiang, Fl. Taiwan 5: 185 (1980) and 6: 654 & 663. 1980; Daly, Brittonia 32: 549. 1980; Fosberg, Otobed, Sachet, Oliv., Powell, & Canfield, Vasc. Pl. Palau 12. 1980; Eleuterius, Illustr. Guide Tidal Marsh Pl. [Miss.-Ala. Sea Grant Publ. 77-049:] 9, 64, & 65. 1980; Fosberg & Canfield, Micronesica 16: 194. 1980; Hu, Journ. Arnold Arb. 61: 91. 1980; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: xxix & 197. 1980; Klein, Sellowia 32: 312. 1980; Lebrón-Luteyn, Eight Decades 13. 1980; Loops, S. Fla. Res. Cent. Rep. T-600: 31. 1980; Mold., Phytologia 45: 36, 38, 40, 209, 270, 296, 470--478, & 504--512, pl. 1--5 (1980), 46: 155 & 511 (1980), and 47: 17. 1980; Mold. in Harley & Mayo, Toward Checklist Fl. Bahia 72--77. 1980; Mold., Phytol. Mem. 2: 6--14, 16--22, 24--27, 29, 32--35, 40, 41, 46, 48, 57, 62, 67, 71, 74--76, 78, 79, 81--84, 89--92, 96, 103, 104, 108--112, 115--126, 128, 129, 133--135, 139, 141, 142, 145--147, 149--160, 163--169, 172, 174, 175, 177--180, 183, 186, 190, 193, 194, 198, 200--203, 205--217, 219--224, 226--230,

233--243, 245, 246, 250--252, 254--258, 260--262, 267, 268, 270, 272--275, 278, 279, 281, 283, 285, 286, 288--290, 292, 293, 296, 298--304, 307, 310, 311, 314, 315, 320, 326, 328, 329, 331, 336, 339, 340, 353, 357, 361, 368, 369, 373, 379, 396--405, 409, 412, 413, 418, 419, 423--432, 435, 436, 442--446, 462, 463, & 596--629. 1980; Prescott, How Know Aquat. Pl., ed. 2, 126, fig. 146. 1980; F. C. Seymour, Phytol. Mem. 1: 85, 307, 311, & 313. 1980; Duncan & Kartesz, Vasc. Fl. Ge. 36. 1981; Hu, Enum. Chin. Mat. Med. 54, 196, & 246. 1981; Briggs in Graves, Austral. Veg. 350. 1981; Cleef, Dissert. Bot. 61: 303 & 160/161. 1981; Corner, Bot. Journ. Linn. Soc. 82: 87. 1981; Cronq., Integ. Syst. Classif. [116]--118. 1981; Dahlgren, Bot. Journ. Linn. Soc. 82: 91. 1981; Foote, Phytologia 50: 24. 1981; Geesink, Leeuwenberg, Ridsdale, & Veldkamp, Thonn. Analyt. Key 9, 11, 20, & 220. 1981; Gómez P., Phytologia 49: 340. 1981; Holmgren, Kauken, & Stafleu, Ind. Herb., ed. 7 [Reg. Veg. 106:] 197. 1981; Kiger, Jacobsen, & Lilly, Internat. Reg. Special. Pl. Syst. 195 & 250. 1981; Klein, Selowia 33: 23 & 36. 1981; A. Löve, Taxon 30: 515. 1981; Mold., Phytologia 47: 410 & 511 (1981), 48: 126, 253, 254, 291, 394, 507, & 511, fig. 1 (1981), and 49: 293, 380--381, 508, 510, & 511. 1981; A. L. Mold., Phytologia 48: 126. 1981; Munz & Slauson, Ind. Illust. Living Things Outside N. Am. 219 & 351. 1981; F. Rose, Wild Flow. Key 441 & 445, fig. 1a & 1b. 1981; F. C. Seymour, Phytol. Mem. 5: 171, 585, & 594. 1981; Sharma, Shetty, Vivekan., & Rathakr., Journ. Bomb. Nat. Hist. Soc. 75: 38. 1981; Silva & Mori, Cent. Pesq. Cacau Bol. Tecn. 84: 8--10, 52, & 53. 1981; Snyder & Vivian, Rare Endang. Vasc. Pl. Sp. N. J. 23 & 97. 1981; W. A. Weber, Mnemonic Three-let. Acron. 4 & 8. 1981; Buck, Bull. Torrey Bot. Club 109: 424. 1982; Cronq. in S. P. Parker, Synop. Classif. Liv. Organisms 1: 471--472. 1982; Duncan, Veg. Sapelo 25 & 48. 1982; Hansold, Bot. Soc. Am. Misc. Publ. 162: 96. 1982; Hera in Ozegahara, Scient. Res. Highmoor 132. 1982; Mold., Phytologia 50: 215, 233--235, 242, 243, 245--248, 250--252, 255, 260--263, 270, 455, & 504--511 (1982), 51: 72, 73, 76, 89, 92, 103, 106, 119, 123, 136, 139, 147, 153, 244--245, 302, 492, 501, & 508 (1982), and 52: 19, 110--113, 119, 178, 181, 182, & 231--232. 1982; Tillett & Steyermark, Ernstia 9: 3. 1982; Bartholomew & al., Journ. Arnold Arb. 64: 95. 1983; Mold., Phytologia 52: 414, 504, 506, 508, & 511. 1983; Rabeler, Phytologia 52: 380. 1983; Reveal, Phytologia 52: 33, 38, 50, 56, 57, 64, 71, & 91. 1983.

BLASTOCaulon Ruh.

Additional & emended bibliography: J. C. Willis, Dict. Flow. Pl., ed. 5, 84 (1925) and ed. 6, 84. 1951; Rouleau, Guide Ind. Kew. 26 & 270. 1970; Hocking, Excerpt. Bot. A.23: 293 & 389 (1974) and A.31: 16. 1978; Giulietti, Bol. Bot. Univ. S. Paulo 6: [61]--65. 1978; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43], 45, 47, 54, & 59, fig. 104--109. 1979; Mold., Phytologia 41: 410 & 504 (1979) and 45: 40 & 504. 1980; Mold., Phytol. Mem. 2: 139 & 596. 1980; Mold., Phytologia 50: 247, 248, 260, 263, 270, & 504. 1982.

BLASTOCAULON ALBIDUM (G. Gardn.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 389. 1974; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63 & 65. 1978; Hocking, Excerpt. Bot. Excerpt. Bot. A.31: 16. 1978; Mold., Phytologia 41: 410. 1979; Mold., Phytol. Mem. 2: 139 & 596. 1980.

Additional citations: BRAZIL: Minas Gerais: Maxia 5779 (Ba).

BLASTOCAULON PROSTRATUM (Körn.) Ruhl.

Additional bibliography: Mold., Phytologia 34: 391. 1976; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Mold., Phytol. Mem. 2: 139 & 596. 1980.

BLASTOCAULON RUPESTRE (G. Gardn.) Ruhl.

Additional bibliography: Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Mold., Phytologia 41: 410. 1979; Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: [43], 45, 54, & 59, fig. 104--109. 1979; Mold., Phytol. Mem. 2: 139 & 596. 1980.

Additional illustrations: Monteiro, Giulietti, Mazzoni, & Castro, Bol. Bot. Univ. S. Paulo 7: 59, fig. 104--109. 1979.

Additional citations: BRAZIL: Minas Gerais: Maxia 5780 (Ba).

BLASTOCAULON SCIRPEUM (Mart.) Giul., Bol. Bot. Univ. S. Paulo 6: 61--65, fig. 1 & 2. 1978.

Synonymy: Paspalanthus scirpeus Mart. ex Körn. in Mart., Fl. Bras. 3 (1): 364--365. 1863. Dupatya scirpea (Mart.) Kuntze, Rev. Gen. Pl. 2: 746. 1902. Dupatya scirpea Kuntze apud Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902. Paspalanthus scirpens Mart. ex Rennó, Levant. Herb. Inst. Agron. 71, sphalm. 1960.

Bibliography: Körn. in Mart., Fl. Bras. 3 (1): 364--365 & 507. 1863; Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöbenhavn. 23: 311. 1871; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 402. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 145. 1902; Ruhl. in Engl., Pflanzenreich 13 (4-30): 124, 133, 284, & 291. 1903; Alv. Silv., Fl. Mont. 1: 103 & 413. 1928; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 145. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 402. 1946; Mold., Known Geogr. Distrib. Erioc. 15, 31, & 54. 1946; Mold., Alph. List Cit. 2: 412 (1948) and 3: 935. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 87 & 211. 1949; Mold., Phytologia 4: 204. 1953; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 145. 1959; Mold., Résumé 102, 282, & 489. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 402. 1960; Rennó, Levant. Herb. Inst. Agron. Minas 71. 1960; Mold., Résumé Suppl. 3: 34. 1962; Mold., Phytologia 20: 362. 1970; Mold., Fifth Summ. 1: 167 & 485 (1971) and 2: 590 & 957. 1971; Mold., Phytologia 33: 146--147 (1976) and 35: 31. 1976; P. Morat, Adansonia, ser. 2, 15: 464. 1976; Monteiro-Scanavacca & Mazzoni, Bol. Bot. Univ. S. Paulo 4: [105]. 1976; Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: [6], 62, 66, & 67, fig. 1 & 2. 1976; Mold., Phytologia 37: 53. 1977; Giulietti, Bol. Bot. Univ. S. Paulo 6: [61]--

65, fig. 1 & 2. 1978; Mold., Phytol. Mem. 2: 158 & 618. 1980;
Mold., Phytologia 50: 247, 248, 260, 263, & 270. 1982.

Illustrations: Monteiro-Scanavacca, Mazzoni, & Giulietti, Bol. Bot. Univ. S. Paulo 4: 67, fig. 1 & 2. 1976; Giulietti, Bol. Bot. Univ. S. Paulo 6: 62 & 64, fig. 1 & 2. 1978.

For a complete résumé of the information known about this taxon, see the bibliography (above), especially Moldenke (1976) and Giulietti (1978).

Emended citations: BRAZIL: Minas Gerais: Martius s.n. [Serra de Mantanha; Macbride photos 18726] (B--isotype, Mu--type, Ld--isotype, Ld--photo of type, N--photo of type, W--photo of type); Mello Barreto s.n. [Herb. Jard. Bot. Belo Horiz. 26496] (N); J. E. Pohl s.n. [in Brasilia] (Mu); A. Silveira 347 [Herb. Mariae-Victorin 15839] (Ld--photo, N--photo). MOUNTED ILLUSTRATIONS: drawings & notes by Körnicke (B).

BLASTOCAULON SPELEICOLA Alv. Silv.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 389. 1974; Mold., Phytologia 34: 391. 1976; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytol. Mem. 2: 139 & 596. 1980.

CARPTOTEPALA Mold.

Additional & emended bibliography: Tomlinson in Metcalfe, Anat. Monocot. 3: 175, 178, 179, 184--187, & 191, fig. 37 A & B. 1969; Rouleau, Guide Ind. Kew. 36 & 270. 1970; Hocking, Excerpt. Bot. A.23: 293 & 389 (1974) and A.31: 16. 1978; Mold., Phytologia 41: 410 & 505 (1979) and 45: 40 & 504. 1980; Mold., Phytol. Mem. 114, 121, 379, & 596. 1980.

CARPTOTEPALA JENMANI (Gleason) Mold.

Additional & emended bibliography: Hocking, Excerpt. Bot. A.23: 293 & 389. 1974; Mold., Phytologia 34: 391. 1976; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytol. Mem. 2: 114, 121, 379, & 596. 1980.

Additional citations: MOUNTED CLIPPINGS: Gleason, Bull. Torrey Bot. Club 56: 14. 1929 (W).

COMANTHERA L. B. Sm.

Additional & emended bibliography: Rouleau, Guide Ind. Kew. 48 & 270. 1970; Hocking, Excerpt. Bot. A.23: 293 & 389 (1974) and A.31: 16. 1978; Mold., Phytologia 41: 410 & 505 (1979) and 45: 40 & 505. 1980; Mold., Phytol. Mem. 2: 115, 121, 124, 140, & 596. 1980.

COMANTHERA KEGELIANA (Körn.) Mold.

Additional & emended bibliography: Hocking, Excerpt. Bot. A.23: 293 & 389. 1974; Giulietti, Bol. Bot. Univ. S. Paulo 6: 63. 1978; Hocking, Excerpt. Bot. A.31: 16. 1978; Mold., Phytologia 41: 410. 1979; Mold., Phytol. Mem. 2: 115, 121, 379, & 596. 1980.

Recent collectors have encountered this species in white, open, fully exposed, sterile sand on savannas, flowering and fruiting in April and October.

Additional citations: GUYANA: Irwin BG.20 (W--2141414); Maas, Westra, & al. 3571 (Ld, N). MOUNTED CLIPPINGS: L. B. Sm., Contrib. Gray Herb. 117: 38--39. 1937 (W); Mold., Phytologia 3: 42. 1948 (W); Mold., Phytologia 4: 338. 1953 (W).

ERIOCAULON Gron.

Additional synonymy: Leucacephala Roxb., Hort. Beng., imp. 1, 68. 1814. Næssmithia Hope ex Savage, Cat. Linn. Herb. Lond. 21. 1945.

Additional & emended bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 206. 1791; Roxb., Hort. Beng., imp. 1, 68. 1814; Blume, Cat. Gewass., imp. 1, 35. 1823; Reichenb., Conspectus Veg. 1: 58. 1828; Loudon, Hort. Brit., ed. 1, 36--37 & 541. 1830; Sweet, Hort. Brit., ed. 2, 546, 597, & 607. 1830; Loudon, Hort. Brit., ed. 2, 36--37 & 541. 1832; Raf., Atl. Journ., imp. 1, 121. 1832; G. Don in Loudon, Hort. Brit., ed. 3, 36--37, 469, 541, 588, & 633. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 719. 1839; Meisn., Pl. Vascul. Gen. 2: 312. 1843; Lindley, Veg. Kingd., ed. 1, 122 (1846), ed. 2, 122 (1847), and ed. 3, 122. 1853; Miq., Fl. Ind. Bat. Suppl. 1: 268. 1860; Lindley & Moore, Treas. Bot., ed. 1, 462 (1866) and ed. 2, 462. 1870; Ulrich, Internat. Wörterb., ed. 1, 83. 1871; Pfeiffer, Nom. Bot. 2 (1): 5 (1874) and 2 (2): 914. 1874; Ulrich, Internat. Wörterb., ed. 2, 83. 1875; Lindley & Moore, Treas. Bot., ed. 3, 462. 1876; J. G. Baker, Journ. Linn. Soc. Lond. Bot. 20: 237. 1883; Van Tieghem, Journ. de Bot. 1: 305--315. 1887; Durand, Ind. Gen. Phan. 454. 1888; Lindley & Moore, Treas. Bot., ed. 4, 462. 1899; Post & Kuntze, Lexicon 623. 1904; Pobeguin, Pl. Méd. Guin. 199--200. 1906; Ruhle, Denkschr. Akad. Wiss. Wien Math. Nat. 79: 87. 1908; Lecomte, Notul. System. 1: 188 & 191--192. 1909; Ruhle, Wiss. Ergebn. Deutsch. Zentralefr.-Exped. 2 (1): 57--58. 1910; Domin, Ann. Jard. Bot. Buitenz. 24 [ser. 2, 9]: 247--248. 1911; Lotsy, Vortr. Bot. Stammesges. 3 (1): 641, 705--709, 711, & 964, fig. 479--482. 1911; Nakai, Bot. Mag. Tokio 23: [209]--[220], fig. 1 & 2. 1911; Nakai, Feddes Repert. Spec. Nov. 9: 466. 1911; Craib, Kew Bull. Misc. Inf. 1912: 421. 1912; E. D. Merrill, Philip. Journ. Sci. Bot. 7: 155. 1912; C. B. Robinson, Philip. Journ. Sci. Bot. 7: 415. 1912; Wangerin, Justs Bot. Jahresber. 39 (1): 474. 1912; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 10. 1913; Höck, Justs Bot. Jahresber. 39 (1): 965, 966, & 1016. 1913; Wangerin, Justs Bot. Jahresber. 39 (1): 550 (1913) and 40 (1): 557. 1913; Höck, Justs Bot. Jahresber. 39 (1): 965, 966, & 1016 (1913) and 40 (1): 1067. 1914; Thonner, Flora. Pl. Afr. 121. 1915; Fedde, Justs Bot. Jahresber. 39 (2): 1386. 1916; Fyson, Journ. Indian Bot. 2: 133--150, 192--208, 259--266, & 307--320, fig. 5 & 8, pl. 1--10. 1921; Alv. Silv., Arch. Mus. Rio Jan. 23: 159--171, pl. 1--5. 1921; Arber, Bot. Gov. 74: 80, 84, 88, 89, & 94, pl. 2, fig. 19. 1922; Mek., Illustr. Fl. Jap. [723] 7 [724]. 1924; Arber, Monocot. 88, 211, & 251, fig. 66. 1925; Correa, Dicc. Pl. Urticáceas Bras. 1: 349. 1926; Ito, Taiwan Skukubutu Dzusetu [Illustr. Formos. Pl.] pl. 847 & 848. 1927; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 179--183. 1927.

[to be continued]

PINACEAE OF THE CHIHUAHAN DESERT REGION

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ABSTRACT

This abbreviated treatment of the Pinaceae, prepared for the Chihuahuan Desert Region flora, recognizes 15 taxa of Pinus and 1 each of Abies and Pseudotsuga. The Region is particularly rich in pinyons, with 8 taxa. The more detailed treatment will be presented in the flora of the Chihuahuan Desert Region being prepared under the direction of Dr. M. C. Johnston of the University of Texas.

A flora of the Chihuahuan Desert Region (CDR) of the United States and Mexico has been in preparation for some time under the leadership of Dr. Marshall C. Johnston of the Botany Department of the University of Texas, Austin. Because the conifers are such a visible part of the landscape of the area and because of their economic, ecological, and ethnobotanical importance, there is considerable interest in the group. Thus, we have been asked to release this abbreviated taxonomic treatment in advance of the publication of the entire flora. This Pinaceae treatment will be revised and expanded (with addition of family and generic descriptions and keys) for later publication in the flora. Comments on this treatment would be appreciated.

The area covered by the CDR encompasses over 500,000 square kilometers and ranges from southern New Mexico and west Texas south through Chihuahua (most northern and eastern parts), Coahuila (most of state except northeast), northeastern Durango, southwestern Tamaulipas, northern Zacatecas, and western San Luis Potosí (map in Johnston, 1977). The mountain ranges within the area are included in the flora, but not the adjacent higher ranges where several additional members of the Pinaceae occur. Thus to the east

are found Abies vejarii Martínez, Picea engelmannii Parry subsp. mexicana (Martínez) Taylor & Patterson (=P. mexicana Martínez), Pinus culminicola Andresen & Beaman, P. greggii Engelm., P. estevezii (Martínez) Perry, P. montezumae Lamb., P. pseudostrobus Lindl., and P. rufa Lindl.; to the west Pinus cooperi C. E. Blanco, P. durangensis Martínez, and P. lumholtzii Robins. & Fern., and to the north in New Mexico, Abies concolor (Gord. & Glend.) Lindl. ex Hildebr., A. lasiocarpa (Hook.) Nutt. and Picea engelmannii Parry subsp. engelmannii. It may be noted that no Pinaceae in addition to those listed above and those known within the CDR are found in New Mexico or Arizona south of latitude 35° N, in Trans-Pecos Texas, or in Sonora or western Chihuahua north of about latitude 29° N.

The pines are by far the most abundant conifers in the CDR, and have been the most intensively investigated (Bailey and Hawksworth, 1979; Bailey and Wendt, 1979; Martínez, 1948; Robert, 1978; Robert-Passini, 1981). We recognize 13 species and 7 varieties for a total of fifteen taxa. The area is particularly rich in pinyons, with 8 taxa. Abies and Pseudotsuga are relatively rare in the CDR (one taxon each) and occur only in the mesic sites of a few of the higher mountain ranges.

I. PINUS L. PINE, PINOS

Subgenus Strobus

1. P. STROBIFORMIS Engelm. [P. ayacahuite Ehrenb. in part; P. flexilis var. reflexa Engelm.; P. reflexa (Engelm.) Engelm.] SOUTHWESTERN WHITE PINE, AYARIN, PINO NAYAR. Tree 20-30 m tall, trunk-diam. 0.4--1 m; twigs flexible, glabrous with glaucous bloom. Fascicles 5-lvd.; lvs. green to bluish green, slender 6--10 cm long, somewhat glaucous beneath, margins remotely serrulate. Seed cones when nearly ripe clear green or dark purple, 15-25 cm long; unarmed terminal umbos projecting at ca. right angle to cone-axis; seed cones when newly open varying from pale yellowish tan to dark purplish brown, 7--9 cm wide, with scales usually highly reflexed esp. lower scales, resinous; penduncles 1.5--2.5 cm long ca. flexible allowing cones to become somewhat pendent as they approach maturity; seeds ca. 1 cm long usually with wing reduced to narrow collar, but occasionally with short wings up to ca. 1 cm long. In mesic mts. above ca. 2200 m, Ariz., N.M., and w. Tex. s. to s. Dgo., Zac., and S.L.P.

2. P. PINCEANA Gord. [P. latisquama Engelm.]. WEEPING PINYON. Tree 6-12 m tall; trunk-diam. 0.2--0.5 m; much branched with rounded crown; branches long, slender, pendent with ashy gray bark remaining smooth for several years. Fascicles almost all 3-lvd.; lvs. pale green, slender, margins entire, 4-10 cm long, position of dorsal stomata variable: throughout length of needles in south but only at the needle tips in the north; resin ducts 2; seed cones

when nearly ripe greenish yellow with dark umbos, 6--10 cm long; seed cones when newly open ovoid, rich cinnamon-brown, lustrous, umbo slightly depressed with minute appressed prickle, non-resinous; peduncles 1--2 cm long, slender, allowing cones to become pendent; seeds ca. 1.2 cm long, wingless but with fine collar separating seed meridionally, with 1 side dark brown, 1 pale brown. Local pinyon found on dry mt.-slopes ca. 1800--2700 m, Coah., Zac., S.L.P., Qro., and Hgo.

3. *P. JOHANNIS* M.-F. Robert. Multi-stemmed shrub or small tree 2--6 m tall; winter buds subcylindric with fine long-tapering scales. Most fascicles 3-lvd., but 4s and even 5s occasionally found; lvs. dark green dorsally, ventrally somewhat glaucous, margins entire, little resinous, 3.5--6 cm long, mid-fascicle width 1.3--1.7 mm, stomatal rows absent on dorsal surface, resin ducts 2, fascicle sheaths on youngest mature needles highly reflexed (often more than 270°) forming a conspicuous rosette at base of fascicle. Seed cones 2.5--4 cm long, 3--5 cm wide, greenish gray to chestnut; peduncles 3--8 mm long; umbo unarmed, ca. 1/4 width of apophysis and often slightly recessed; seed shells 0.5--1 mm thick. Originally described from mts. just w. of Concepción del Oro, Zac., but also in the cloud zone of some higher mts. of Coah. and S. M. Or.

4. *P. DISCOLOR* Bailey & Hawksw. [*P. cembroides* var. *bicolor* Little] BORDER PINYON. Tree 5--12 m tall; trunk diam. 0.2--0.8 m; crown spreading, rounded; winter buds subcylindric with long-tapering scales, tips reddish, sometimes reflexed. Most fascicles 3-lvd., but 4s and even 5s occasionally found; lvs. dorsally dark green, ventrally extremely glaucous, virtually white, margins entire, little resinous, 3--6 cm long, mid-fascicles 1.3--1.6 mm wide; stomatal rows absent on dorsal surface, resin ducts 2 (-1); sheaths on youngest mature fascicles highly reflexed (often more than 270°) forming a conspicuous rosette at base of fascicle. Seed cones when open 2--3 cm long, 2.5--4 cm wide, peduncles 3--6 mm long, rather fine, apophyses when dry varying from lustrous yellowish to rich reddish brown, protuberant, umbos small and often slightly recessed; seed shells 0.5--1.2 mm thick. 1300--2700 m, mainly in mts., se. Ariz., sw. N.M., ne. Son., and nw. Chih., but isolated small pops. (mostly above 2500 m), s. Chih., Dgo., and S.L.P. *P. discolor* appears to be unique in *Pinus* in being nearly dioecious; female trees tend to predominate, esp. at n.-most locs.

5. *P. CEMBROIDES* Zucc. [*P. llaveana* Schiede; *P. osteosperma* Engelm.] MEXICAN PINYON, PINONERO. Tree 5--12 m tall, trunk-diam. 0.2--0.8 m; crown often spreading, rounded; winter buds subcylindric with fine long-tapering scales sometimes with reflexed tips. On same tree some fascicles 3- some 2-lvd.; lvs. dark green dorsally, ventrally variable glaucous, margins entire, little resinous, 3--6.5 cm long, mid-fascicle width 1.2--1.6 mm; stomatal rows present on all

surfaces, though usually fewer on dorsal surface, resin ducts 2 (--) ; fascicle sheath on youngest mature needles highly reflexed (often more than 270°) forming a conspicuous rosette at base of fascicle. Seed cones when newly open varying from rich reddish brown to yellowish brown, globose or subglobose, at base often flattened; axis 2.5--4 cm long, 3--5.5 cm wide, peduncles 2--5 mm long, scales relatively few, apophyses when dry reddish brown, wrinkled; umbos protuberant, ca. half width of apophyses; seeds wingless, ca. 1.4 cm long, moderately pointed at proximal end, dark brown to black, sometimes mottled; seed shells 0.4--1.0 mm thick, ca. dry locs. in open stands, 1450--2700 m, w. Tex., Chih., s. to cent. Mex., and s. Baja C. Common Mex. nut pine; seeds much used for food, 2 vars.: , var. lagunae Robert-Passini, s. Baja C., and

5a. P. cembroides var. cembroides, w. Tex, Chih, s. to cent. Mex.

6. P. REMOTA (Little) Bailey & Hawksw. [P. cembroides var. remota Little, P. caterinae Robert-Passini]. PAPER-SHELL PINYON. Tree or shrub 4--7 m tall, trunk diam. 0.2--0.4 m; crown irregular, not always conspicuously rounded; winter buds subcylindrical with fine long-tapering scales. On same tree most fascicles 2- but some 3-lvd.; margins entire, little resinous; 3--5.5 cm long, 1.3--1.8 mm wide; lvs. ventrally somewhat glaucous, occasionally non-glaucous, stomatal rows present on all surfaces, though usually fewer on dorsal surface, resin ducts 2--5 with 2's more common in the north; fascicle sheath on younger mature needles slightly to moderately reflexed (usually less than 180°). Seed cones when open 2.5--3.5 cm long, 3--5 cm wide, peduncles 5--8 mm long; apophyses when dry ochre to reddish brown and only slightly raised, umbos recessed, less than half width of apophyses; cones fragile, distal portions of apophyses curling inward leaving sharply pointed scales, seed shells paper thin (0.1--0.3 mm), 450--1650 m, w. Tex., Coah., e. Chih., w. N.L.

7. P. EDULIS Engelm. [P. cembroides var. edulis (Engelm.) Voss]. ROCKY MOUNTAIN PINYON. Tree 6--15 m tall; trunk diam. 0.2--0.8 m; crown compact, irregularly rounded; branches stiff; winter buds ovoid with coarse, broadly deltoid scales. On same tree fascicles mostly 2-lvd., occasionally few 1-lvd., and/or 3-lvd.; lvs. dark green dorsally, ventrally glaucous, margins entire, resinous, 3--6 cm long, mid-fascicle width usually greater than 1.7 mm, smaller when singled-needed, fascicle axis usually curved through 25° or more. Seed cones when newly open pale brown to greenish tan, globose or subglobose, base flattened, with axis 3--6 cm long, 4--7 cm wide, with relatively few scales, apophyses protruding, raised at center, umbo slightly depressed at center tending to conceal minute prickle; peduncle length shorter than 3 mm; seeds wingless, moderately thick-shelled, 1.4 cm long, not esp. pointed at proximal end, medium brown. 2 vars., both in CDR.

7a. *P. edulis* var. *edulis*. Most or almost all fascicles 2-lvd.; lvs. rather stout, resinous, stomatal rows present on all surfaces but usually fewer on dorsal surface, resin ducts 2 (--) 1500--3100 m., Colo., e. Ut., N.M., Ariz., w. Tex.; barely entering CDR near the trees' s. limits in s. N.M. and w. Tex. Common nut-pine of the sw. U.S., seeds much used as food.

7b. *P. edulis* var. *fallax* Little, ARIZONA ONE-NEEDLE PINYON. Most fascicles 1-lvd., on same tree a few 2-lvd, little resinous, resin ducts 2--8, 1100--1700 m., sw Ut.; nw., cen. and se. Ariz.; sw. N.M., known from CDR only in the Florida, Summit, and Big Burro Mts., N.M. Further study is needed of this taxon and its relationship to *P. monophylla* Torr. & Frém., the one-needle pinyon of the Great Basin.

8. *P. NELSONII* Shaw. PINÓN PRIETO. Tree 5--9 m tall; trunk diam. 0.2--0.4 m; often with multiple very straight stems; branches ca. flexible; winter buds subcylindric with long, tapering, fine scales. Fascicles 3-lvd. but connate, thus appearing 1-lvd., dark green, 4--9 cm long; stomatal lines on all surfaces; resin ducts 1--2; fascicle sheaths persistent (unique in subgenus *Strobus*). Individual leaves with serrulate margins, a character unique in the pinyons. Cones often in pairs; seed cones when young greenish yellow with protuberant apophyses and purplish unarmed dorsal umbos, almost non-resinous; seed cones when open subcylindric, 8--14 cm long, dark reddish brown; protuberant apophyses highly reflexed; peduncles scaly and extremely long and stout, emerging from branchlet, which is usually less thick, at right angle, but curving backward through nearly 90°, 4--6 cm long, 6--10 mm thick. Seeds ca. 1.5 cm long, wingless, dark chocolate-brown. Very distinctive, rare and local pinyon found on mt. slopes, ca. 1900--2500 m., Coah., N. L., Tam. and S.L.P.

Subgenus *Pinus*

9. *P. TEOCOTE* Schlecht. & Cham. Tree 10--30 m tall; trunk diam. 0.4--0.9 m; cylindric-conical when young, usually with single stem; branches slender to thick, young branchlets with glaucous bloom turning reddish brown with age. Fascicles mainly 3-lvd., but occasionally some 2- and 4-lvd. fascicles; lvs. bright green, slender, margins serrulate, 8--14 cm long. Seed cones when nearly ripe ovoid-conical, medium brown, 4--6 cm long, 2--3 cm wide; when open 3--5 cm wide, non-resinous, with small, usually deciduous prickles; peduncles 0.6--1.8 cm long, 4--6 mm thick. Seeds mottled, ca. black, ca. 5 mm long, wing ca. 15 mm long. Usually found among other pines at mesic mt. sites, 1500--3000 m, Chih., Coah., se. to Guat.

10. *P. ENGELMANNII* Carr. [*P. macrophylla* Engelm.; *P. ponderosa* var. *macrophylla* Shaw; *P. apacheca* Lemm.; *P. latifolia* Sarg.]. APACHE PINE, PINO REAL. Large tree 15--35 m tall; trunk diam. 0.6--1 m;

single stems often clear; branches stiff, exceptionally thick even at tips. Most fascicles 3-lvd., 3--3.5 mm thick, retained only 2 yrs. resulting in prominently clumped appearance at branch ends; lvs. dark green, serrulate, 25--45 cm long, seed cones when nearly ripe ca. asymmetrical, often clustered, pale yellowish brown, 12--18 cm long, 5--7 cm wide; when open hard and durable, 8--10 cm wide scales chocolate-brown on inner surface, dark brown almost black beneath; apophyses highly reflexed, yellow brown, subconical, protuberant, armed with a strong persistent prickle 1.5 mm long tending to point inward; cones sessile; a few basal scales persistent on branch after cone fall; seeds dark brown, 6--8 mm long, wings 20--30 mm long. Seedlings exhibit a conspicuous "grass" stage. At mesic sites in lower mts., 2100--2400 m, s. Ariz. and s. N.M., s. to Zac. and Aguasc., perhaps barely entering CDR in e. Dgo.

11. P. PONDEROSA Laws. [P. brachyptera Engelm.]. PONDEROSA PINE, WESTERN YELLOW PINE. Usually large trees 10-70 m tall; trunk diam. 0.3--2 m; single stems massive, straight; crown open, rounded; branches stiff, moderately thick even at tips, often turning up at tips; bark blackish and furrowed on younger trees, turning with age to large irregular thick plates becoming orange-yellow. Fascicles nearly all 3-lvd. to nearly all 2-lvd; lvs. yellowish green to dark ca. grayish green, thick, serrulate, 10--25 cm long, retained 4--6 yrs, but often appearing as brush-like clumps at end of bare branches; base of fascicles 1.5--2.5 mm thick; resin ducts 2--6 per needle. Seed cones when nearly ripe ovoid-conical, often in clusters of 2--3, greenish-brown to ochre, 5--12 cm long, 3--6 cm wide, when open 4--10 cm wide, scales pale brown above, dark purplish brown beneath; apophyses protuberant, ca. reflexed, armed with strong persistent prickles 1.5--2 mm long tending to point outward; prickles on upper scales even curving upward; cones sessile; a few basal scales persistent on branch after cone fall; seeds 6--8 mm long, dark brown, almost black, articulate wings 15--25 mm long. Perhaps the most widespread pine in N.A., and the most important economically, B.C., Mont., N.D., s. to Colo., Ariz., N.M. and w. Tex.; n. Son., and n. Chih., 0--3100 m, 2 vars.: var. ponderosa, B.C., Mont., s. to Calif., and:

11a. P. ponderosa var. scopulorum Engelm. [P. scopulorum Lemm.; P. ponderosa subsp. scopulorum (Wats.) Weber]. Tree 10--35 m tall; trunk diam. 0.3--1.2 m. Fascicles on same tree 3--2 lvd., often almost all 2-lvd.; lvs. dark green, 10--18 cm long. Seed cones 5--9 cm long, 4--7 cm wide when open; seeds 6 mm long, wings 17 mm long. 1500--3100 m, cen. Mont. to s. Ariz., N.M., w. Tex., possibly in n. Son. and n. Chih.

12. P. ARIZONICA Engelm. [P. ponderosa var. arizonica Shaw]. Tree 10--35 m tall; trunk diam. 0.3--1.2 m; single stems massive, straight; crown open, somewhat rounded; branches stiff, often turning up at tips; bark blackish and furrowed on younger trees,

turning with age to large irregular thick plates parting on surface into thin closely appressed pale cinnamon-red scales. Fascicles on same tree 5-, 4- and 3-lvd.; lvs. medium to dark green, moderately thin, serrulate, 10--30 cm long; needles retained 3 yrs., but often as brush-like clumps at ends of bare branches; resin ducts 4--10 per needle. Seed cones when nearly ripe ovoid-conical, often in clusters of 2--3, greenish brown to ochre, 5--14 cm long, 3--6 cm wide; when open 4--10 cm wide, scales pale brown above, much darker beneath; apophyses moderately protuberant, somewhat reflexed, armed with rather fine reflexed pricles not always persistent, ca. 1 mm long and tending to point downward; peduncles short, very thick; seeds 7--9 mm long, dark brown almost black; articulate wings 15--30 mm long. Se. Ariz., sw. N.M., Son., Chih., Coah., Dgo., Tam., N.L. and possibly Zac., 1300--3000 m. 2 vars., both in our area.

12a. P. arizonica var. arizonica. Lvs. rather fine; fascicles commonly 5-lvd. in N. but with an increasing frequency of 3- and 4-lvs. in Coah., 10--16 cm long, at base 1--1.5 mm thick; resin ducts 5--10 per needle. Seed cones 5--9 cm long, when open 4--7 cm wide; peduncles generally hidden by basal scales of open cones, remaining on tree with few basal scales when cones fall. Se. Ariz., sw. N.M., Son., Chih., Coah., and Dgo., 1600--3000 m. A variable taxon readily distinguished from P. ponderosa var. scopulorum in se. Ariz., and sw. N.M. by its more slender needles, usually in fascicles of 5, thin glaucous twigs. and smaller cones with less prominent prickles. In Coah., distinctions are less clear as needles are mainly in fascicles of 3 and twigs not always glaucous.

12b. P. arizonica var. stormiae Martínez. Fascicles varying from mainly 3-lvd. in N. to mainly 5-lvd. in S., ca. 17--30 cm long, at base 1.5--2 mm thick; lvs. rather coarse with 3--8 resin ducts. Seed cones 8--14 cm long, when open 6--10 cm wide, medium to pale brown; peduncles short and thick but sufficiently long to remain visible when cone is open, not sessile, fallen cones sometimes complete. A rather local, but distinct taxon, Chisos Mts., Tex.; Coah., N.L. and Tam., 1300--2300 m. This taxon differs sufficiently from P. ponderosa var. scopulorum and from P. arizonica var. arizonica to warrant further careful study.

13. P. LEIOPHYLLA Schlecht. & Cham. Tree 15--35 m tall; trunk diam. 0.3--1 m; single stems ca. irregular; crown rather open, rounded; branches irregular, somewhat pendent in older trees; branch tips ca. 0.5 cm thick, flexible; bark on older trees nearly black, thick, deeply and irregularly fissured, often exhibiting many epicormic (adventitious) shoots. Lvs. fine, bluish green, ca. glaucous, serrulate, 6--15 cm long; fascicles on same tree 5--4--3 lvd., with sheaths deciduous (unique to subsect. Leiophyllae in the subgenus Pinus). Seed cones when nearly ripe ovoid-conical, numerous on fine branches, 4--8 cm long, 2--3.5 cm wide, yellow-brown turning gray, when open 4--6 cm wide; apophyses ca. flat, armed

with inconspicuous, weak prickles; conspicuous peduncles ca. 1 cm long; cones requiring 3 yrs to ripen (unique in CDR) and persistent for many years; seeds ca. 0.5 cm long with wings 1.7 cm long, brown. Cen. Ariz., sw. N.M., se. to Oax. 1500--3700 m., 2 vars.: var. leiophylla, Chih. s. to Oax., and:

13a. P. leiophylla var. chihuahuana (Engelm.) Shaw [P. chihuahuana Engelm.]. CHIHUAHUA PINE. Small tree 15--25 m tall; trunk diam. 0.3--0.6 m. Fascicles usually 3-lvd. but occasionally more, 6--10 cm long. 1600-2500 m. Cen. Ariz., sw. N.M., s. to Dgo., barely entering CDR in nw. corner.

II. ABIES Mill. FIR, OYAMEL

1. A. DURANGENSIS Martínez. Tree 20--40 m tall; trunk diam. 0.4--1 m; twigs reddish brown, finely hairy to smooth. Lvs. 1--4 cm long with rounded to acute tips; sometimes emarginate; stomata on both surfaces. Seed cones pale to medium brown, cylindric or long-ovoid, 5.5--10 cm. long, 3.5--4 cm wide; bracts not exserted. 2000-2900 m. 2 vars.: var. durangensis, S.M. Occ. in Chih. and Dgo.; and:

1a. A. durangensis var. coahuilensis (I.M. Johnst.) Martínez. [A. coahuilensis I. M. Johnst.]. COAHUILA FIR, GUAYAME BLANCO. Tree 20--30 m tall; trunk diam. 0.4--0.9 m. A poorly defined and probably rare var. separable from var. durangensis by vegetative chars. such as shorter lvs. 1--2.5 cm long, a thicker hypoderm along midrib of underside of needle, and with 2 halves of double fibrovascular bundle contiguous. We have not been able to confirm some additional differences mentioned by Martínez, such as hairiness of twigs and stomatal frequency on upper surface of needles. In CDR known only from Sa. de la Madera and Sa. Maderas del Carmen, Coah., 2100--2600 m; also found at Rincón de María and in Serranías del Burro, Coah. just outside CDR.

III. PSEUDOTSUGA Carr. DOUGLAS-FIR

1. P. MENZIESII (Mirb.) Franco [P. taxifolia (Lamb.) Britt.]. Large tree 20--75 m tall, trunk diam. 0.5--3 m, twigs dark brown to reddish, finely hairy at first. Lvs. 1.5--3.5 cm long, with usually blunt, but sometimes acute and rarely even attenuate tips. Seed cones when nearly ripe dark purplish brown with straw-colored bracts, 3--10 cm long, 1.5--5 cm wide. 0--3300 m. 2 vars.: var. menziesii, B.C. s. to Calif., and:

1a. P. menziesii var. glauca (Beissn.) Franco. ROCKY MOUNTAIN DOUGLAS-FIR, GUAYAME COLORADO. Tree 20--40 m tall; trunk diam. 0.5--1.5 m. Lvs. 1.5--2.5 cm long. Cones 3--7 cm long. Common in higher mesic mts. in CDR, 1800--3300 m. B.C., Alta. se. to Pue. Based upon work of Mlle. Flous, Martínez (1963) recognized several spp. in Mex. which, pending further study, we have included in this taxon.

LITERATURE CITED

- Bailey, D. K., and F. G. Hawksworth. 1979. Pinyons of the Chihuahuan Desert Region. *Phytologia* 44:129-133.
- Bailey, D. K., and T. Wendt. 1979. New pinyon records for northern Mexico. *Southwest. Natural.* 24:389-390.
- Johnston, M. C. 1977. Brief resume of botanical, including vegetational, features of the Chihuahuan Desert Region with special emphasis on their uniqueness. P. 335-359, IN, Transactions of the symposium of the biological resources of the Chihuahuan Desert Region, United States and Mexico, (R. W. Wauer and D. H. Riskind, Eds.), U. S. Dept. Interior, National Park Service Transactions and Proceedings Series No. 3.
- Martínez, M. 1948. Los Pinos Mexicanos, Ed. 2, 361 p. Univ. Nac. Autonoma de Mex., Mexico City.
- Martínez, M. 1963. Las Pinaceas Mexicanas., Ed. 3, 401 p., Univ. Nac. Autonoma de Mex., Mexico City.
- Robert, M.-F. 1978. Un nouveau pin pignon Mexicain: Pinus johannis M.-F. Robert. *Adansonia*, Ser. 2, 18:365-373.
- Robert-Passini, M.-F. 1981. Deux nouveaux pins pignons de Mexique. *Bull. Mus. Natn. Hist. Nat. Paris.* 4e Ser., 3, Sect. B, *Adansonia* 1:61-73.

BOOK REVIEWS

Alma L. Moldenke

"GARDENS ARE FOR PEOPLE", Second Edition, by Thomas D. Church with Grace Hall & Michael Laurie, xv & 256 pp., 43 color & 286 b/w photo. & 52 landscapes diag. McGraw-Hill Book Company, New York, N. Y. 10020. 1983. \$37.50 oversize.

The original edition by the senior, now deceased, author was published in 1955 by the engulfed Reinhold Publishing Corporation. This new revision is a beautiful testimonial to this senior author by his assistant and by a professor of landscape architecture. It is copiously and excellently illustrated not only with beautiful photographs of all types of gardens for different locales and tastes but also with many professionally prepared landscaping diagrams. The great Church contribution to the landscaping of gardens is the emphasis that they have become "part of the house and a house that moves easily and gracefully into the garden is the ideal balance". Designs, principles and garden architecture, along with the needed sundries, are explained in well written text that closes with "When your garden is finished, I hope it will be more beautiful than you had anticipated, require less care than you had expected, and have cost only a little more than you had planned."

"COMMON PLANTS OF THE MID-ATLANTIC COAST - A Field Guide" by Gene M. Silberhorn, xiii & 256 pp., 100 b/w line draw., 1 map & 1 fig. John Hopkins University Press, Baltimore, Maryland 21218. 1982. \$7.95 paperback & \$17.50 clothbound.

From Long Island Sound in New York past the Delmarva Peninsula and the Outer Banks to Cape Fear in North Carolina this book presents the common plants (1) of beach, dunes and maritime forest, (2) of salt and brackish marshes and (3) of freshwater wetlands, tidal and nontidal. There are easily followed keys to each of these areas that lead to right-hand text descriptions with additional items of interest and left-hand pages with easily recognized, carefully made line-drawings by Mary Werinner. This book makes an excellent text for shoreline ecological studies on many levels or an excellent companion for a seaside stroll.

"FLORA OF PUERTO RICO AND ADJACENT ISLANDS: A Systematic Synopsis"
by Henri Alain Liogier & Luis F. Martorell, iii & 342 pp.,
University of Puerto Rico Press. 1982. \$15.00 paperbound &
available from Editorial de la Universidad de Puerto Rico,
Apartado de Correos X, Estacion de la Universidad de Puerto
Rico, Rio Piedras, P. R. 00931.

This annotated synopsis is the first complete revision after half a century of Britton & Wilson's "Botany of Puerto Rico and the Virgin Islands". It adds new native and naturalized plants, the most recent nomenclature and synonymy, and revised habitat and geographic distribution notes. Also it very helpfully gives the more important common names and the page references in B & W where pertinent. Since geographic range is cited, this careful study should prove useful to those interested in general West Indian and neotropical botany as well. The senior author has been a prestigious field and herbarium worker in Cuba, Costa Rica, the Dominican Republic and the New York Botanical Garden.

"THE FLORA OF THE HORTOBAGY NATIONAL PARK" edited by J. Szukló-Lacza, 172 pp., 21 b/w photo., 15 tab., 8 fig., 15 line draw. & 3 maps. Publishing House of the Hungarian Academy of Sciences, P. O. 24, H-1363 Budapest, Hungary. 1982. \$17.50.

This national park, with two adjacent preserved forests, was established in 1972 and this book really provides an annotated catalogue of the included flora in its articles on angiosperms (782), aquatic and soil algae, microscopic and higher fungi, lichens, bryophytes and pteridophytes. The line drawings are particularly clear and helpful, but many of the photographs are not printed clearly. Lycopus is listed in the Verbenaceae instead of the mint family.

"BARK BEETLES IN NORTH AMERICAN CONIFERS: A System for the Study of Evolutionary Biology" edited by Jeffry B. Milton & Karen B. Sturgeon, x & 527 pp., 43 b/w fig., 35 tab., 10 photo. & 1 map. University of Texas Press, P. O. 7819, Austin, Texas 78712. 1982. \$30.00 clothbound & \$17.50 paperbound.

The ten differently authored papers are from separate meetings rather than a single congress of "evolutionary biologists, geneticists, forest entomologists, and forest geneticists" and "is intended to contribute to the literature on coevolution by assimilating theory and data on a single but extensively studied system... The bark beetles of the family Scolytidae. Different chapters consider the population dynamics of the beetles, geographic variation and taxonomy, resistance and susceptibility of their host trees, and evolutionary interactions with predators and parasites and with microorganisms symbiotically associated with them" and

also management and control of these forest pests. There are a very full bibliography, a helpful glossary, and a seven-page chart on host utilization of Scolytidae checked against the Pinaceae, Taxodiaceae, Cupressaceae and Taxaceae. The study should prove important to many students, technicians, foresters, entomologists, etc.

"THE SEARCH FOR THE PAST - Fossils, Rocks, Tracks and Trails.

The Search for the Origin of Life" by L. B. Halstead, 208 pp., 65 color photo., 149 fig., 223 b or br/w photo, 51 fig., 4 tab. & 18 maps. Doubleday & Company, Inc., Garden City, New York 11530. 1982. \$19.75.

The famous British paleontologist-author of this delightful book has long been interested in sharing his field with the public. The beginning chapters include ways in which any interested person can look critically at rocks to recognize their structures and how fossils are formed and can safely and effectively be extracted. Every opened page reveals some interesting, attractive illustration. The text is clearly printed and clearly explained. If you know a preteenager or teenager wondering about studying or working in the field of fossils, geomorphology, evolutionary biology, and all kindred interests, share this book with him or her for guidance. School, college and public libraries should have this book available. Our top private schools could use it advantageously in science courses.

"BIRDS OF TROPICAL AMERICA" by Alexander F. Skutch, xii & 305 pp., 32 b/w photo., 37 line draw., & 3 tab. University of Texas Press, P. O. 7819, Austin, Texas 78712. 1983. \$29.95.

This book should be a source of joy and information for the great number of bird lovers and for those visitors to Neotropics who would like to recall those that they had seen or had missed. Thirty-four among pigeons and doves, cuckoos and trogons, quetzal and chachalacs, kingfishers and motmots, tinamous, and others are described in their natural habitats and activities as studied for so many years by the world-famous ornithologist-ecologist-author. "I have tried to do justice to both aspects of bird study, the scientific and the aesthetic", and also to "the heavy predation that prematurely destroys so many of the nests that have been found after long, diligent searching."

"THE CARBOHYDRATE CRAVER'S DIET" by Judith J. Wurtman, x & 240 pp. & 11 b/w tab. Houghton Mifflin Company, Boston, Massachusetts 02108. 1983. \$12.95

What will appeal to the trained scientist-readership of this journal is the scientific explanation of the premise for this diet and the condensed reports on the author's (and others') statisti-

cally sound experiments on rats and humans at the Massachusetts Institute of Technology. Absorbed carbohydrate foods fill a metabolic need by eliciting insulin secretion that raises plasma tryptophan that accelerates serotonin synthesis in the brain and subsequently reduces the intake of carbohydrates but not of proteins (which may even have a reverse effect). This well-balanced, specifically stated diet allows for some satisfying carbohydrates in each meal and in a daily snack to a total of 1100 calories. The large print and direct language make for easy reading.

"POPULAR ENCYCLOPEDIA OF PLANTS" edited by Vernon H. Heywood, Chief, 368 pp. & over 800 color photos. Cambridge University Press, Cambridge, England & New York, N. Y. 10022. 1982. \$29.95.

There are over 8,000 alphabetically arranged, fully cross-referenced and beautifully illustrated entries that provide "a wealth of information on the plants around us and the ways in which they influence our lives." The "information has been gleaned from the most up-to-date scientific sources and for this reason alone it will provide a valuable reference work for the professional botanist as well as the general reader." This very attractive book deals with plant "species employed by Man because of their economic importance, because of their ornamental value, or because of their special scientific interest." These alphabetical entries cover all the principal crop species of the world: cereals, legumes, oil plants, fruits, vegetables, beverages, stimulants, fibers, as well as timber trees and other plants of economic importance." This book should be made available on public library, school, college and botanical institution book shelves.

"A FIELD GUIDE TO THE ATMOSPHERE" by Vincent J. Schaefer & John A. Day, xx & 359 pp., 32 color photo., 336 b/w photo., 45 fig., 15 tab. & 2 maps. Houghton Mifflin Company, Boston, Massachusetts 02108, 1981. \$9.95.

This book is prepared as a member of the Peterson Field Guide Series. It is sponsored by both the National Audubon Society and the National Wildlife Federation. The authors are long and well skilled in the subject matter. The text deals with clouds, optical phenomena, precipitation forms, small pollution particles and storms as seen from the ground, planes and satellites. There are many well legended photographs. "The several appendixes contain a great deal of handy tabular and graphical information dealing with rare phenomena, water records, and safety suggestions."

"THE BIOLOGICAL ASPECTS OF RARE PLANT CONSERVATION" edited by Hugh Synges, xxviii & 558 pp., 90 b/w fig., 40 tab., 18 maps & 4 photo. Wiley Interscience Publication of John Wiley & Sons, New York, N. Y. 10158. 1981. \$71.95.

Herein are the 42 vital papers comprising the proceedings of an international conference held at King's College, Cambridge, in July 1980 under the aegis of the Linnean Society of London and the Botanical Society of the British Isles. Incidentally, it was so well funded and efficiently organized that moneys from the sale of this book will all go for plant conservation. The papers are grouped in 6 sections which were followed by question-answer periods: (1) Survey and Assessment of Rare and Threatened Species, (2) Tropical Forests - The Conservation Priority, (3) Understanding Rarity and Monitoring Rare Plant Populations, (4) Ecological Studies of Rare Plants, (5) Introductions and Re-introductions, and (6) Protected Areas for Plant Conservation. Appendices deal mainly with Red Data Book information on plants of varying degrees of scarcity. The index includes plant names. This book should prove to be an important world-wide reference source in university classes, botanical institutions, and enlightening reading as well as a guide for land developers and those who can control them.

"FUNGAL PHYSIOLOGY" by David H. Griffin, xii & 383 pp., 113 b/w fig., 114 tab. & 56 photo. Wiley Interscience Publication of John Wiley & Sons, Inc., New York, N. Y. 10158. 1981. \$32.50.

"This book is aimed at the senior-graduate student level [concentrating]....on those aspects of physiology where fungi are significantly different from, and often unique among, other organisms". The subject is approached from the experimental point of view and emphasizes the reasoning for these approaches. The text is a gem - a beautifully cut diamond - for clarity. It is effectively and copiously supplied with pertinent tables, figures and photographs. After an introduction to the organization of the thallus and the various classifications, the text deals with chemistry and molecular structure, metabolism, chemical requirements for growth and absorption of nutrients, sporulation and syngamy, and fungicides and fungal attack mechanisms.

"MYCOLOGY GUIDEBOOK" edited by Russell B. Stevens, xxiv & 712 pp., 40 b/w fig. & 13 tab. University of Washington Press, London & Seattle, Washington 98105. 1981. \$35.00.

This second and revised edition is not so labelled in the title but it is so for the original, long exhausted, 1974 printing to which have been added some corrections and a very useful detailed index. The book certainly succeeds in its stated

intention "to facilitate improvements in introductory mycology teaching" by (1) the "introduction of considerably more living material" and (2) "supplementation of the orthodox morphologic view with information from genetics, physiology, industrial mycology, fungus ecology and medical mycology". There are hundreds of pages of instructions for instructors, providing much more than laboratory manuals. Much of this material can be useful to professional mycologists, botanists, microbiologists, lichenologists and phytopathologists.

"MARINE ALGAE IN PHARMACEUTICAL SCIENCE" Volume 2 edited by Heinz A. Hoppe & Tore Levring, xi & 309 pp., 57 b/w photo., 17 fig., 2 maps & 34 tab. Walter de Gruyter & Co., New York, N. Y. & D-1000 Berlin 30, West Germany. 1982. DM.140 or \$63.70.

The 14 papers herein presented come from a special session at the X International Seaweed Symposium with the first constituting a Review on Marine Algae: Their Products and Constituents by the first-named editor who mentions food, agar, carrageenan, alginates, fucoidan, laminaran, vitamins, and antibacterial, antibiotic, antifungal and antiviral substances among others. The second group of papers is on special constituents such as fat production in freshwater and marine algae, anti-ulcer substances and the extraction of Vitamin B₁₂. The last group of papers is a miscellaneous one treating such things as virus infection of marine algae and the cellular biology of Acetabularia. This field is of growing importance in both pure and applied sciences.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN FLOWERS - Eastern Region" by William A. Niering & Nancy C. Olmstead. 1979.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN FLOWERS - Western Region" by Richard Spellenberg. 1979.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN TREES - Eastern Region, by Elbert L. Little. 1980.

"THE AUDUBON SOCIETY FIELD GUIDE TO NORTH AMERICAN TREES - Western Region, by Elbert L. Little. 1980.

These and some others in this series have been reviewed enthusiastically in this journal. All are published by Alfred A. Knopf, Inc. and distributed by Random House, Inc. What does not receive mention in typical short reviews is that these books were prepared very skillfully and attractively produced by Chanticleer Press, Inc., under the skilled direction of Paul Steiner. This is a monumental task and achievement.

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Typescripts should be prepared single-spaced on clean white heavy bond smooth and opaque paper. Elite type is probably the most space-economical. Typescript text must not exceed a rectangle 5 $\frac{1}{2}$ inches wide (horizontal) by 8 $\frac{1}{2}$ inches high (vertical), not including the running-head and page number.

The title of the paper should be typed in all uppercase (capital) letters with 2 blank lines above the title and one beneath; then the name of the author in ordinary upper-and lower-case letters, along with his address (if so desired); followed by 2 blank lines; then the first line of text. It is usually best to leave a blank line between paragraphs.

All scientific plant and animal names *and* group names should be typed either in italic type (if available) or underscored. Any corrections in the text made by the author must be complete and neat as they will be photographed as they are.

The finished typescript as submitted by the author will be reduced from the 8 $\frac{1}{2}$ x 5 $\frac{1}{2}$ inch size as submitted to 6 2/8 x 4 inches by the printer. It is therefore advisable to place a centimeter or millimeter scale on all text figures and plates included.

Use a *new* heavily inked black typewriter ribbon and be sure to *clean* the type on the typewriter after each several pages of typing.

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Articles dealing with research in all lines of botany and plant ecology, in any reasonable length, biographical sketches, and critical reviews and summaries of literature will be considered for publication.